THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XVI. No. 394—19th YEAR.] LONDON, NOVEMBER 26, 1867. [Subscription per Ann. { 15s. in Advance / 18s. Credit.] DOUBLE No. Price 1s.

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Gas-Works, Bolton, Nov. 11, 1867.

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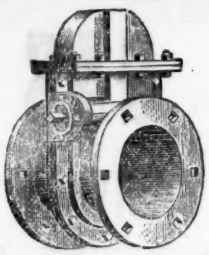

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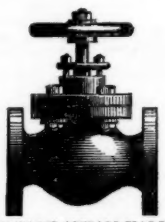
¾ ,,	0 6 0
1 ,,	0 8 6
1¼ ,,	0 11 0
1½ ,,	0 14 0
1¾ ,,	0 18 0
2 ,,	1 2 6



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6 ,,	4 17 0
7 ,,	6 0 0
8 ,,	7 5 0
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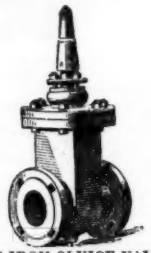
10 ,,	10 10 0
11 ,,	12 5 0
12 ,,	14 0 0



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Bore.	Price.
2 inches	£1 10 0
3 ,,	2 5 0
4 ,,	3 0 0
5 ,,	3 16 0
6 ,,	4 14 0
7 ,,	5 14 0
8 ,,	6 16 0
9 ,,	8 0 0
10 ,,	9 6 0
11 ,,	10 14 0
12 ,,	12 4 0

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TO CORRESPONDENTS.

J. H. (Ballymena).—*A very small stream of water dropped down the rising-pipes of the retorts will assist in keeping them clear, or an earthenware pan filled with water and laid in the mouthpieces will answer the same purpose.*

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 26, 1867.

Notes upon Passing Events.

According to a paragraph that seems official, the Government is about to introduce a bill for purchasing up the various internal telegraphic lines, and for attaching an amalgamated system to the Post-Office. Not being *doctrinaires*, and ridiculously prejudiced against any extension of Government work, we have more than once expressed a decided opinion that the internal lines of telegraphs would be much better in the hands of the Government, as it is impossible to grant a monopoly, of that system of communication to any one company. The reasons for this transfer are just the reverse of those urged for the transfer of railways to Government hands. Telegraphing is as simple an operation as stamping a letter—within the capacity of many men, women, and children. The telegraph is most urgently wanted at the most inconvenient hours, and at places where there is the least ordinary communication. A monopoly of the telegrams from London to Manchester would be a very fine thing, and as it is not a monopoly half a dozen companies compete for the thriving and growing traffic. But companies do not find it pay to keep a telegraph clerk in an obscure village—such as "Wansford, in England," for instance—for the chance of twelve messages in the course of a year, still less to keep a messenger ready to convey the telegrams when they come. Yet it is to obscure villages that it is often desirable to forward messages of incalculable importance. The Government has in the Post-Office a complete network of machinery capable of indefinite extension, embracing every population of the least importance. To extend the telegraphic as far as the post-office system would at least quadruple its utility. Post masters and mistresses are not overpaid; an increase of salary for the telegram business would be useful and gratefully received. If any are too stupid to learn the simplest system of telegraphing, that would be a reason for selecting, out of the wonderful number of national school and middle-class prize scholars, young women competent for the duty. As to the delivery of messages, boys, active and willing, are to be found in every village, and ponies too, if the post-horse duty be repealed, as it ought to be. The rock on which we fear an official telegraph system might split would be the desire to make it very profitable. That will never do. For success, in a national point of view, the telegrams all round must pay their expenses and a little more. The great towns will yield great profits, and support establishments separate from the post-office. These profits should be appropriated to paying the expenses of telegraphs to villages like Little Pedlington and Bullock Smithy. We are now suffering from the eagerness of the Post-Office to make a better and better balance-sheet every year. In London, at any rate, the Post-Office business is executed most abominably. The minor servants of the Post-Office are unanimous in declaring that the heads of the departments employ too much cheap and nasty labour to perform confidential duties.

Sir Richard Mayne, K.C.B., is, no doubt, a zealous and energetic officer. We do not believe that any man attains such a position as his without very considerable merit. But he is a martinet—a fiery, angry, overbearing gentleman, who will not bear contradiction, or even information, where it does not square with his preconceived ideas. It is impossible to have a few minutes conversation with him, or to watch his rapid, almost furious, feverish walk, without feeling that he is a very irritable man, with all the materials for being a tyrant, if it were not for the pressure of the daily morning and evening public opinion. The costermonger is the natural enemy of the policeman—on neither side is any love lost. He is very rude and very strong; almost always in fighting condition. To get drunk is one of the ordinary relaxations of a successful or unsuccessful "coster." In his class it is no disgrace, and only a misfortune, to be locked up. The coster's language is habitually coarse, his chaff is racy and aggravating, and never more so than when directed against a "bobby." When, to use his vernacular, he gets "tight," his instinct is to first chaff, and then fight the policeman, whose authoritative "Move on" with that barrow!" he resents, and whose success with

cooks and housemaids he envies. But the costermonger, although neither a very savoury nor a very sweet-tongued personage, has his uses, and those not small ones, in a city where free trade has been carried out to the utmost. He and his wife or donkey, or all three, distribute over the area of the metropolis a vast quantity of useful food, that could in no other way be distributed and brought to the doors of a class of society who have little time to go to market, and no servants to send. At times of glut, whether of herrings or mackerel, Ostend rabbits, French apples, or Bahama pineapples, the costermonger comes to the rescue, greatly to the advantage of the consuming millions. Without these rude but stout, energetic fellows, food worth millions sterling would rot as manure. We regretted, therefore, to see that this useful class had been handed over to the unchecked rule of Sir Richard Mayne, and are glad to find that one of the first operations of the November Parliament has been to do something and say more for the donkey cavalry and commissariat of London. After this hint from the powers above, we trust that Sir Richard will introduce order without suppressing trade.

Captain Sherard Osborne, one of the most intelligent and brilliant officers of our navy—who has, we believe, retired from active service to accept a commercial appointment—has published a letter in the *Times*, showing that the attempts of Mr. Reed to supersede Captain Coles's turret-ship system by inventions of his own—abortions would not be too strong a term—are wasting much valuable time and money. It was a step in advance for the Admiralty to employ a trained mechanic to superintend a mechanical department, instead of a superannuated post captain or admiral; but it was and is a great mistake to employ an inventor and patentee, with all the peculiar jealousy and greediness of that class. The Admiralty ought to have the use of all the inventive talent of the age, but it has not! The whole energy of Mr. Reed, the naval constructor, is employed in pushing into notice and executing his own inventions, and his assumed improvements on other people's inventions. In every naval inventor Mr. Reed sees a rival, and spares no pains to snub him, and shelve his work. We need not enter into a comparative view of the merits of broadside, turret, and box ships; all may have merits, but it is important to point out the absurdity of allowing an omnivorous inventor to decide on the merits of his rivals, and settle how their designs, if executed at all, in deference to public opinion, shall be executed. Colonel Boxer has introduced great improvements in small arms, but it is notorious that no inventor has any chance of success in his department unless he will consent to be Boxerized.

Two companies appear to be in the field for the purpose of laying tramways down in the streets of the metropolis. The one—"Metropolis Street Railways"—seems to confine its plans to the Surrey side, and proposes, by fifteen tramways, to connect the bridges of the Thames, from London Bridge to Westminster, with the districts now served by the various Kennington and Atlas omnibuses. The other—the "London "Street Tramways"—takes in both sides of the water, and pays particular attention to all the vast traffic to be found in the districts of Highgate, Holloway, Camden Town, St. John's Wood, Paddington, Bloomsbury, and Clerkenwell, as well as the Kennington Cross lines of the other company. It is to be hoped that these schemes, especially those for accommodating the north side of the Thames, will be so framed that they can be accepted by the Legislature. It is quite plain that underground railways can never do all we require—they cannot give a from-shop-to-shop conveyance. A tramway omnibus company must provide smooth, easy, swift carriages; waiting-rooms at the principal diverging stations; and have a tariff fixed by the Act incorporating it, in which the existence of the halfpenny should be recognized. A three halfpenny and a twopence halfpenny fare would meet many wants.

A Norwegian application of the Cornish jacketed steam-boiler to ordinary cookery is at present the subject of experiments by the Society of Arts. The article was exhibited at the Paris Universal Exhibition. It consists of a saucepan without a projecting handle and with a tight lid. Into this saucepan a piece of meat is placed, with a sufficient supply of water or stock. It is brought to as rapid a boil as possible, and then packed into a felt-lined air-tight box. There it remains for three or four hours, and, on being opened, the stewing process is found to have been performed to perfection. If on full experience this arrangement should be found adapted to domestic use, it will be most easily applied by the assistance of gas. Cooking by gas is not usually an economical process, but in this instance, where a sharp fire for a short time is needed, a well-arranged ring of gas will be found cheaper than a coal or coke fire. For an army on march, this invention will be of great value. The jacketed kettles may be conveyed in waggons, and the soldiers sit down to a hot meal, without further preparation, at the first halt.

It is understood that the Government has yielded to the pressure of common sense, and that foreign cattle markets are to be established at every port of importation. This done, all restrictions on the internal trade will be removed. At the foreign cattle markets *abattoirs* will be established, in which all cattle exposed in the market must be slain. In London, it is proposed that the new market shall be under the control of the Corporation. It will be a pity if the opportunity be not taken of breaking through a monopoly injurious to public interests. The competition of a market under the Metropolitan Board of Works could not fail to work better. Of course there will be another market day for foreign stock, at which British, under the same regulations, can be sold.

Mr. Doulton is finding out the inconvenience of representing an ultra-virtuous community. Elected as a parish patriot and sanitary reformer by the severely-sober Dissenting interest, he has fallen into the ways of the once despised aristocrats of St. James's and Pall Mall, and tried to combine, with moderate success, the antecedents of a Puritan and the life of a man about town; but the expenses of a man about town are not to be measured by the frugal habits of the one o'clock dinner style of his youth. The profits of his pots, and pipes, and pans were not enough, so he dabbled in finance—a capital game as long as it lasted—and now he regrets, no doubt, that he did not stick to his pots and pipes, and remain satisfied with the "goody" and dull amusements of Lambeth and Kennington. Mr. Doulton did unquestionably attain a certain measure of success in his fashionable aspirations. It was scarcely possible to imagine that the M.P. travelling on great commercial enterprises in Italy, with a Foreign Secretary's introduction in his pocket, was the simple stoneware manufacturer who was once patronized by the now forgotten sanitary reformer, F. O. Ward. Well, success breeds envy, and many of Mr. Doulton's colleagues, who once were quite as great parish patriots as himself, have fallen rather flat in their way through the world, and at least one snob would be delighted to find symptoms of a crack in the Lambeth M.P.'s character. The desired opportunity has been found in the Court of Bankruptcy. There poor Mr. Furness, the favourite of Mr. Bazalgette and Mr. Doulton, has been obliged to go, and no wonder, since it seems he paid twenty thousand pounds for his sureties in one contract, and nine thousand pounds in another. In the Bankruptcy Court he relates that Mr. Doulton found him two sureties at the moderate price of nine thousand pounds, and when called on to say why he thought Mr. Doulton shared in this profitable transaction, he says, because he found Mr. Doulton's name on bills which the two sureties could not renew without Mr. Doulton's consent. Mr. Doulton declares that there is nothing in this suspicion, and we are quite willing to believe him. It is, it seems, one of his amusements or charities to do good to contractors. In the way of charities, we all have our fancies. One clergyman gave up his life to vain attempts to reclaim gipsies; others prefer young thieves; some people care nothing for a man unless he is black. Mr. Doulton's fancy is a contractor. He is one of those who "do good by "stealth, and blush to find it fame." Well, the matter has gone into a committee of the Metropolitan Board, where two or three seem most anxious to put a perpetual extinguisher on the philanthropic and other exertions of the Lambeth M.P. But Mr. Doulton is not alone in benefiting society and the Metropolitan Board by supplying a little food for scandal. Mr. Roche seems even more calculated to shine as a sharp member of an unpaid municipal assembly. Mr. Roche is an attorney, and in practice. No doubt he is an exception to the general rule, but every one who has had any experience in dealing with parochial and municipal assemblies, will bear us out in the assertion that, as a general rule, the most mischievous, meddling, hair-splitting member—the most unscrupulous jobber—will be found in a practising attorney. He is generally a man who, not having enough legitimate practice, goes into public to find more. If he is very low down he joins the Reform League; if he has any connexion with the moneyed world he aspires, in London, to the Common Council or the Metropolitan Board. There, if

you listen to him, he does nothing for himself, but when hardly pressed he may admit that he does something for his clients. Mr. Roche, it seems, when the contract for the Thames Embankment, in which Ridley and Furness were competitors, was tendered for, was solicitor to the Lundy Granite Company, and before the decision he ingeniously contrived to get a provisional contract, first from Ridley and then from Furness, to take his company's granite "if approved by the engineer." This was really clever, although it did not answer, for it seems that Mr. Bazalgette preferred some other granite to the Lundy. But still Mr. Roche's intentions were equally creditable to his profession as an attorney. His vote at the board might be worth nothing, but it got him two chances for his company. Mr. Roche tries to diminish the value of his services by stating that he held no shares in the Lundy Granite Company. Of course he did not—*pas si bête;* but it may fairly be presumed that he did not perform the Talleyrandish operation of hedging between Ridley and Furness without charging something for the operation. Here, for the present, we may leave the "two Arcadians," Doulton and Roche, and wait for further information.

The charity of the British public is unbounded, and its purse seems limitless, but being human, after all, it cannot take in every cry and every claim at the same time. We are happy to note that charity seems lately to be directed towards home. Interesting negroes, mild Hindoos, and men-eating cannibals, of any tribe, attract less attention than in the most exciting times of Exeter Hall. A powerful and successful effort has been made towards filling up one of the greatest wants of London—Convalescent Hospitals. When a poor man is seriously ill, or meets with a serious accident, and is conveyed to a London hospital, he is better off than persons in a much higher position with ten times his income. Warmer, well-ventilated rooms, the best medical attendance and advice, trained nurses, suitable food, ample supplies of every needful appliance for comfort and cleanliness are at his disposal. But when he is pronounced convalescent, no longer a fit subject for an hospital or infirmary, he is too often not fit for wages-earning work, not able to pay for the nourishing food, the airy lodgings, the change of air and scene required by his condition, and for want of such comforts and luxuries he sinks into a state of hopeless chronic disease. Every employer of workmen knows how frequently he is called upon to relieve such cases of distress, and often he feels that it is impossible to find a means of spending properly the money he is willing to contribute. Convalescent hospitals—for more than one are required—will supply this grievous gap. They ought to be established in pleasant scenes—some at the sea-side, within convenient access—and be open not only to the patients to be sent free by subscribers, but to those in narrow circumstances who are willing to pay a sum equal at least to the cost of their food and washing. We have been informed that at the German hospitals patients properly accredited are received as indoor patients at a weekly payment. In this great city there are hundreds, if not thousands, who, while preserving an appearance above that of mechanics, are, if not reduced to destitution by sickness or accident, utterly friendless, dependent on the divided labour of a lodging-house servant, or the coarse attention of a paid, untrained, and ignorant nurse. For such, on terms of payment, a place should be found in convalescent hospitals.

The cabmen are not satisfied with the new street regulations, neither are the public. London is better supplied in number with street cabs than most capitals. Let those who know Paris speak. In Hansom cabs we have something better than any city on the Continent. As for cabmen, as a rule we maintain that they are as civil as can be expected in a most irritating employment—being exposed to all weathers; often least employed when money is most needed; and having to put up with the caprices and hard bargains of most unreasonable customers, male and female, especially the latter; taxed severely by the Government, and, again, if they want the certain customers of certain railway-stations. To reconcile the conflicting interests of both cabmen and customers, movements should be made in opposite directions. Cabs, men, and horses should be much more closely supervised. The tax, reduced, should be made payable for the year in advance, and with a sensible reduction where one owner has more than a certain number of cabs: this seemingly unjust sliding-scale, being to discourage the very worst class of cabmen—those who own a cab and one horse for the summer season. "Butterflies" they are called in the trade; they certainly are grubby enough. The condition and pay of the licensed watermen should be so raised that they should be protectors to the public in the matter of fares. The revenue derived from the tax on cabs and omnibuses, or a large part of it, should be paid over to the various local boards to a fund to be devoted to the repair of roads. Cabs at a higher fare than the lowest should be sanctioned, if marked in such a manner as to be distinguished by day or night. Mr. Haddon, the engineer consulted by the police authorities, has proposed a plan for inducing cabmen to wear a neat uniform. It would be well, if practicable; but we dread any unnecessary tax that may prevent a poor man from taking the first step to improve his condition.

Speaking of road repair, there is a bit of the Upper Street leading to Highbury from Islington well worth the attention of road reformers. It was laid with a dressing of fresh, sharp macadam when repaired in the usual manner, then coated with coarse gravel, and finally rolled flat with a heavy steam roller. The first result was that it was fit for use the day after the machine rolling; no irregular holes were worked, the traffic has gone over it for more than a month, and seems to work regularly, and not in patches and lines as where the traffic is left to level the torturing macadam. Proprietors of cabs and omnibuses would pay a tax with pleasure if it were to be devoted to levelling such roads as this.

Mr. Simon has published an extraordinarily fat report on his department at the Board of Health—so very thick that it wants more than one paragraph for a due notice.

Circular to Gas Companies.

Notices have been given by seven different parties that it is their intention to make application, during the present session of Parliament, for at least as many separate Acts for the regulation of the gas supply of the metropolis. The most important of these is a Bill, of which notice has been given by the solicitors of the gas companies, for the amalgamation of the thirteen existing companies into one company, or into two, three, or four new companies. As the number of the companies into which it is proposed to amalgamate is not fixed, no intimation can yet be given of the terms and conditions on which such amalgamation is intended to be effected. The notice states generally that the application to Parliament will be for an Act to dissolve all the existing metropolitan gas companies, and to incorporate the shareholders, or some of them, into one new company, or into two, three, or four new companies, and to vest in the new company or companies the undertakings and effects of every description of the existing companies. The Act is to limit the districts of each new company, to provide for any future alteration of them, to fix the capital and borrowing powers of each, and "the rights, privi-" leges, preferences, and priorities of the proprietors therein," and for the application of the revenues and obligations of the existing companies. It is also intended to provide for the apportionment of the present capitals among the shareholders of the new company or companies, for the division of the shares, and the payment of their respective debts. Power is to be given to raise more money by the creation of preference, ordinary, or debenture shares or stock, or by mortgage. Compensation is to be provided for all persons holding places or offices in the management, administration, and control of the affairs of the existing companies, and a superannuation-fund is to be established for the officers or servants of the new companies. Power is to be given to the amalgamated companies to purchase lands, coal mines, and collieries, collier ships, railway trucks, and all other things necessary for the procuring of coal at a cheap rate. The notice includes the grant of power to alter, amend, consolidate, enlarge, or repeal all the Acts of Parliament relating to the existing metropolitan gas companies, including the Metropolis Gas Act of 1860. The wording of the notice, which is dated the 14th of November, shows that great uncertainty then prevailed among the gas companies separately, as to the course of action they should adopt in carrying the proposed application to Parliament into effect, and we fear that at the present time there is no greater approach towards unanimity. We have heard, indeed, that six of the thirteen gas companies protested against any notice for amalgamation being given, but they may be induced, on further consideration, to act in unison with the other companies, as all their interests are closely bound together at the present time, and they should

combine firmly and judiciously to resist the attacks aimed against them. Several of the companies are, it is true, differently circumstanced from others, and they may feel inclined to seek their own advantage by separate action; but desertion from the common cause at this critical time may prove not only injurious to the general body but prejudicial to themselves. It has been suggested, as inducements to the severance of union, that the City Company and the Great Central may hope to sell their undertakings on favourable terms to the Corporation; that the South Metropolitan and Independent may consider themselves beyond the influence of any amendment in the Metropolis Gas Act, as they already supply gas at a lower price than it was proposed to insert in the general Bill of last session; and the Equitable, by the voice of their chairman at their last meeting, objected to any scheme of amalgamation, in which opinion the chairman of the City of London Company recently concurred at a meeting of the Chartered Company. This want of concord among the directors of the metropolitan gas companies, from whatever causes it may arise, augurs very unfavourably for the interests of the holders of metropolitan gas shares, and must discourage their friends in the Legislature from interfering in any effective manner on their behalf. The necessity for a settlement of the metropolis gas question on a liberal and equitable basis becomes every year more and more imperative, and the longer it is delayed the more difficult will it become. These are not the times for a rigid maintenance of what are considered rights. The proposed concessions acceded to last session by the metropolis gas companies, had they been made two or three years ago, would have produced a satisfactory settlement of the question for many years; but an obstructive, illiberal policy excites opposition, concessions so enforced give rise to further demands, and it becomes almost impossible to appease popular clamour. We apprehend that the metropolis gas companies are not at present in an equally strong position to resist unreasonable demands as they were at the commencement of the last session of Parliament. The unjust attack then made on the vested rights of the companies by the Bill introduced by the Board of Trade, roused a spirit of indignation which compelled the Government to succumb; but it may be very difficult again to excite a similar feeling, especially after the hostile report of Mr. Cardwell's committee. The altered position of the gas companies is strongly stated in a recent article on "Parliament "and the Gas Companies," in the *Saturday Review*, which may be considered indicative of the change of opinion on the subject in the independent press. The *Review* censures the representatives of the gas companies for having been too conciliatory at the beginning of the session, when the game was in their hands, and for not having conceded enough, but displaying instead an unreasonable obstinacy, when their interests were at the mercy of an unfriendly tribunal. "If," it is observed, "the offer of the committee had been accepted, the "tax on the revenue of the companies could scarcely have ex- "ceeded 1 per cent., but now the remaining nine-tenths are "in considerable jeopardy." Again, it is remarked—"The "advisers of the companies probably thought that the House "of Commons—which, but for their own weakness, would have "protected them in the present year—would guard their "rights in future. They forgot that the report of the com- "mittee will alter the conditions of the question, and they "committed the still more fatal error of forgetting the Reform "Bill." With failing friends and an increasing number of enemies, the necessity of union for the protection of their common property becomes the more urgent, and any dissensions among the gas companies now will most seriously prejudice their interests.

The Bill of which the Corporation of London have given notice will differ considerably from the Bill which they promoted last year. It is proposed to purchase in the first instance, by agreement, the works of the West London Junction Gas Company at Kensal Green, constructed originally for the lighting of the Great Western Railway and Hotel; the pretext for that purchase being the lighting of their cattle market. The Corporation apply also for power to purchase, by compulsion or agreement, all or part of the works of the City of London, the Great Central, and of the Chartered Gas Companies; and two pieces of land, closely adjoining each other, at North Woolwich and East Ham, about six miles in a direct line from any part of the City, whereon to erect works for the manufacture and storing of gas, and for the manufacture of products. The Corporation require to be authorized to supply gas to all parts of the City, and to the Metropolitan Meat and Poultry Market, and to the Cattle Market at Islington. Power is further required to lay mains to connect the proposed gas-works with the various points of supply. The money for carrying into effect these purposes is to be borrowed on the credit of the Corporation funds.

The Imperial Company and the Chartered Company renew their applications for powers to raise additional capital, and to purchase lands for new sites for additional works. The land required by the Imperial Company is situated close to Bow Creek, at West Ham; and the proposed new site of the Chartered Company is on the banks of the Thames, at Barking Creek, about seven or eight miles in a direct line from the company's present limits of supply. The Imperial Company seek for power, either by themselves or in combination with other companies, to purchase railway trucks, collier ships, coal mines, and collieries, to enable them to reduce the cost of coals; and they also require to be relieved from the obligation of extending their mains into any district within their limits not already lighted with gas, and for the lighting of which their present works may prove inadequate. The Chartered Company apply for power to sell gas in bulk to other companies, and to lay down mains for making the necessary connexions with the mains of any other company requiring such supply. The quantity of land which each of the two companies applies for power to purchase is sufficiently extensive for the requirements of the gas supply of all London.

A notice, to which the names of Messrs. Wyatt and Metcalfe are attached, has been given of application for an Act, the object of which appears to be to carry out the principal recommendations of the report of the committee of last session, including within its scope all the companies that were specially excluded by the Metropolis Gas Act. It is proposed to take power to amalgamate compulsorily or by agreement all those gas companies into one, two, three, or four companies, the terms of amalgamation to be settled by arbitration, if not agreed on; to improve the illuminating power of the gas, the quality, pressure, and the terms and conditions of supply; to establish a new mode of testing the gas, at the expense of the companies and local authorities; to reduce and regulate the capitals of the gas companies, and to determine the rights and priorities of the different shareholders; to limit the profits and dividends and rates of interest, and to repeal the right to apply the surplus profits of one year to make good previous deficiencies; further, to make the supply of public lamps by average meter indication compulsory; to provide for the better regulation, inspection, and audit of the accounts; for the more speedy recovery of penalties against the companies, and for the appointment of officers to carry out the various regulations. It is proposed to compel the gas companies to sell gas in bulk to the Metropolitan Board of Works and the Commissioners of Sewers, and to restrain them from selling gas otherwise; those bodies having power to acquire compulsorily the undertakings of the several companies. Another notice, to which no name is attached, states that it is intended to apply to Parliament for an Act, the objects of which seem to be nearly similar to those indicated in the preceding notice. Power is required to regulate and improve the illuminating power, the quality, price, and pressure of the gas, and the terms and conditions of supply, including nearly all the provisions specified in the notice signed by Messrs. Wyatt and Metcalfe, with the exception that the proposed amalgamation of the companies is not to be compulsory, nor to include any but the companies specified in the Metropolis Gas Act, the general object being to ensure a better and cheaper supply of gas to the metropolis. The seventh notice, which relates to the Brentford Gas Company, scarcely affects the metropolitan gas companies, unless it be as regards the new limits within which it is proposed to supply gas, which are to include the parishes of Hayes, Norwood, Southall, Harlington, Cranford, East Bedford, and Greenford, all in Middlesex.

For some time there was much uncertainty respecting the parties at whose instance the notice has been given, signed by Messrs. Wyatt and Metcalfe, the well-known parliamentary agents. It was at first reported that the notice had been given on behalf of the Board of Trade, in opposition to the recommendation in the report of the committee that the Government should not interfere in the matter; but that report has been officially contradicted. It is now understood that the real parties are the delegates of the metropolitan vestries, and

that they are assiduously endeavouring to induce the Corporation of London to take it up. For that purpose they sent a deputation to the Common Council on Thursday last, to urge them to do so; but the premature adjournment of the court prevented the subject from being brought forward, and its consideration was postponed to the next meeting. There is still great mystery respecting the anonymous notice, and strange rumours are afloat concerning it to which we should exceedingly regret to give credence. One thing, however, is quite clear, that the metropolitan gas companies will, during the present session of Parliament, have to sustain a contest for their existence even fiercer than any they have hitherto encountered, and that their only chance of maintaining their position as profitable undertakings will be to hold firmly together.

The threatened attacks on the property of the metropolitan gas companies have for some time past caused a continued decline in the market value of their shares, which may even reach so low a point as to tempt local authorities to enter into negotiations for the purchase of some of the undertakings. The formation of new gas companies in London at present is quite out of the question. Nor does the value of gas property abroad present a more tempting field for speculation. Any one who will take the trouble to examine the share list will find that the present market value of the shares of the companies introduced on the London Stock Exchange during the last five years for the erection and working of foreign gas-works under exclusive concessions, represents a loss of more than £850,000 on the par value of the shares in those companies, which is a heavy sum, considering the limited number of capitalists by whom such investments are held. Gas consumers as a body are little to be relied on as shareholders in a gas company, and few of them have capital to spare for speculations.

A slight accident at the works of the Imperial Gas Company at King's Cross, during the night of the 14th inst., has been magnified by some portions of the daily press into a terrific conflagration which threatened to destroy the whole of London. The exaggeration, misrepresentation, and rhodomontade with which the "occasional reporters" described the occurrence, surpass anything we remember of their previous efforts to swell molehills into mountains, and the fabulous narration has been adopted and commented on in a leading article of the *Daily Telegraph* as a warning against permitting "gas volcanoes" to be erected within miles of inhabited houses. The old fallacy of the danger of the explosion of gasholders is revived with increased vigour, and St. Paul's Cathedral, which is at least a mile from King's Cross, is brought by the excited imagination of the writer "within a stone's throw," to show the imminence of the danger it escaped "almost by a miracle." A "colossal "pillar of flame," we are told, "shot up at once into the sky "which water would not quench, the pillars of the gasholders "became red-hot, and all the retorts—and there were 900 "*beds*—were fired, all the gas that had been collected was "allowed to escape, and *rolled away in vast clouds;*" it being evidently the notion of these public instructors that gasholders are stored with smoke. The real facts of the case are briefly these:—The tar, as it flows from the hydraulic mains at the works at King's Cross, is collected in an intercepting cistern of cast iron, about 15 feet in diameter, and sunk 25 feet into the ground. Some alterations were in progress, and a tarpauling to protect the men employed in pumping out the tar was supported on poles, under which a gaslight was temporarily placed for the use of the men at the pumps. A slight explosion, caused it is believed by a collection of naphtha vapour, set fire to the tarpauling and the poles, which was communicated to the tar in the intercepting cistern, producing a large body of flame, which was however extinguished by closing down the cover of the cylinder with sand and clay, and by flooding it with water. In the excitement of the moment, the lids of some of the retorts were slackened, and the flames issuing from them appeared to increase the magnitude of the danger, but they were quickly screwed up again, and the operations were resumed as usual. The manufacture was not for one instant stopped, nor was the supply affected in the slightest degree. The whole of the damage done will not cost more than 50s. to repair. The paint on the pillars of the gasholders, which the fabulous narrative represented to be red-hot, was not even blistered. The manager and two of the men were slightly burnt whilst aiding in shutting a valve, but no serious personal injury was sustained.

It was reasonably expected that the failures of the Metropolitan Board of Works in the two last sessions of Parliament to obtain legislative sanction to their subway schemes would have deterred them from further attempts, but they seem determined to persevere, and have given notice of their intention to bring in a Bill this session to compel gas and water and telegraph companies to use such subways when made. In the last session their Bill passed the House of Commons, and was read a third time in the Lords, but there was not time to proceed further with it, and the provisions of the proposed measure had been so far amended in committee as to remove most of the objections to it, excepting those arising from the danger of explosions, which the Board declared to be impossible, and yet refused to be responsible for the damage should they occur. Provisions were introduced to the effect that the operation of the Act should be limited to the subways already constructed or in the course of construction, that no rent should be chargeable for their use, and that the cost of removing the pipes from any street into the subways should be defrayed by the Metropolitan Board. So far as can be gathered from the notice of the proposed Bill, the Metropolitan Board intend to throw the cost of removing the mains and pipes into the subways on those who use them, and to extend generally their powers for the construction of such underground passages. Those provisions may require to be watched and opposed by the gas companies, but the ratepayers are the parties who have most cause to complain at the wasting of the public funds on such fanciful projects.

A recent strike of the stokers and labourers employed on the gas-works at Preston has been manfully and successfully resisted. The demands of the stokers were a reduction of the hours of work from twelve to eight, and an increase of wages from 26s. to 28s. per week; and that when employed as labourers their wages should be raised from 2s. 8d. to 3s. per day; and, further, that work must cease on Saturday at twelve o'clock instead of one. The letter containing these demands stated that if they were not complied with all the men would leave the company's employ within a fortnight. Mr. Green, the manager, having received full authority from the directors to act in the matter, determined to resist these extortionate demands, and engaged a number of labourers in case of necessity. He then told the men that he should not accede to their demands; whereupon, as soon as they had received their wages, they declared they would not come to work again excepting on their own terms. They were, however, induced to remain until the following Monday, on the pretext of consulting the directors. On that day they left the works in a body to the number of 50. The new hands were immediately called in, and set to work in the best manner they were able, under the guidance of Mr. Green and a few old servants. As may be conceived, they had very hard work of it, the superintendents being engaged day and night for several days, and only able to snatch a few hours occasional rest. The supply of gas was not, however, interrupted, and, after a fortnight's experience, the new hands made within 20,000 feet of the customary quantity of about 900,000 feet of gas in 24 hours. The old hands, on finding that the strike had been a failure, and that their services could be dispensed with, applied to be taken back again. The services of about 12 of them have been accepted, those employed as stokers on the former terms, and the others are employed as labourers, at 16s. a week, wheeling cannel for the new hands working in their places. Much credit is due to Mr. Green for the determined and persevering manner in which he resisted the illegal attempt at extortion, and overcame the extraordinary difficulty in which he was suddenly placed.

The Dundee Town Council have held several meetings respecting the proposed transfer of the gas-works to the local authorities. The Scotch have modes of conducting public business, and special verbiage adapted to legal proceedings, which seem strange to those not "to the manner born;" but we gather from the reports of what has taken place that it is intended to bring two Bills into Parliament this session, the object of one of which is to be the completion of the agreement with the two gas companies for the transfer of their works on such terms "that they cannot in honour refuse to promote it;" and in the event of that Bill not being carried, the second Bill is to empower the Town Council or the Police Commissioners to purchase the works of the new company separately, according to a provision in that company's original Act, by which they are bound to sell their works to either of these bodies. We have little doubt the gas companies will complete the agree-

ment on reasonable terms, and that there will be no necessity to proceed with the second Bill, which if passed would have the effect of placing the local authorities in competition with the old Dundee Gas Company.

Mr. Flintoff has been amusing a select audience of thirty or forty persons at King's Lynn; the charge of one shilling for admittance having probably had an adverse influence against a more numerous attendance. Mr. Flintoff is a man whose mind is open to conviction, which may naturally account for his change of opinions with altered circumstances, for there was a time when he was an energetic opponent of municipal trading in gas, and poured out the phials of his wrath on the Corporation of Manchester on that account; but now Corporation management is his *beau idéal* of the supply of gas, and he is travelling about the country as its advocate. King's Lynn, however, is not a promising field for Mr. Flintoff's operations, and he admitted that he could not excite the gas consumers to get up a public meeting for the expression of their grievances, and that he was consequently obliged to lecture on his own account, trusting to the entrance-money to pay his expenses. Of the lecture itself nothing need be said. It was the stereotyped edition of his previous tirades against gas companies, and on the manner in which gas may be manufactured and supplied, according to his estimates, at a much lower price. The gas consumers of King's Lynn have, notwithstanding Mr. Flintoff's assertions to the contrary, no reason to complain. The gas is manufactured from first-class Newcastle coal, with 10 per cent. of Boghead cannel, therefore the illuminating power may be safely estimated at 16 candles. The price charged to consumers whose accounts amount to more than £50 per annum is 3s. 6d. per 1000 feet; to those whose accounts amount to £10 per annum, 3s. 9d.; and to smaller consumers 4s.; while the price for the public lamps is estimated not to exceed 2s. 8½d. per 1000 feet. Under such circumstances King's Lynn, where coal costs 14s. 6d. and cannel 52s. per ton, was not a place well selected for agitation for cheap gas. The lecture seems to have gone off rather flatly; and it was brought to an abrupt conclusion by the audience rising to depart while Mr. Flintoff was replying to a question about gas-meters. They carried with them a reminiscence of the lecturer in a smart satirical sketch, liberally distributed in the room, of his varied career, the merits of which Mr. Flintoff, being himself poetical, would be able to appreciate. A local paper has since published a letter from a correspondent, charging us with libelling the lecturer by publishing, some years since, a profit and loss account of his abortive company in Sheffield, verified by its chairman, in which the attempt to supply gas at 3s. per 1000 feet was shown to have resulted in an enormous loss. The writer would have done his townsmen more service had he proceeded to show how much the gas consumers of Sheffield have now to pay as dividend on the capital wasted in the abortive attempt to carry out Mr. Flintoff's theories.

Register of New Patents.

404.—Henry Houfe, of Tollington Park, Upper Holloway, in the co. of Middlesex, for "*Improvements in outside lamps or lanterns for shop-fronts, or other similar places.*" Provisional protection only obtained. Dated Feb. 13, 1867.

For the purposes of this invention the front portion of the lamp or lantern is constructed of transparent glass, as usual, whilst the back thereof is constructed of opal glass, or other suitable semi-transparent and reflecting material. By the use of these improvements the light is reflected as required on to the window or other desired place, whilst the street or other place where the lamp or lantern is situated is rendered light by reason of the back of the lantern being of semi-transparent material, thereby obviating the darkness in the street or other place caused by the use of the ordinary outside lamps or lanterns having metal or other opaque backs applied thereto. The lamp or lantern may be constructed in any suitable manner, and may be suspended from above, or fixed upon a post or pillar, or in any other suitable manner as desired.

406.—William Jones, of Liverpool Street, King's Cross, in the co. of Middlesex, gas engineer, for "*Improvements in lamps.*" Patent dated Feb. 13, 1867.

This invention relates to such lamps as are intended to be used for throwing light into shop windows from outside, and for other purposes, and consists of a globe of glass, the half of which next the window is composed of transparent glass, and the hinder or outer half is composed of enamelled glass or other semi-transparent substance adapted for reflecting the light of an internal gas-burner on to the window. The hinder or outer half of the globe may be also composed of silvered glass or enamelled iron, or other suitable material, with a lining or coating adapted for reflecting light as required. In some cases it may be advisable to vary the form of the globe, which is composed of two convex glasses, as above stated, and to make it somewhat flattened instead of being spherical. The globe is suspended by means of a metallic band (by which it is encircled) from a gas-supply pipe in the form of two supporting arms fixed at the two opposite sides of the band, one of which arms conveys the requisite supply of gas to a ring inside the band, and thence to the burner, the air being admitted as required through suitable apertures in the bands. The glass chimney of the burner extends through an aperture in the top of the globe into a metal shaft with a cowl at the top, such metal shaft being supported quite independently of the globe, and prevented by stops from resting on the top of the same. This metal shaft is capable of being raised and lowered as required by working in vertical guides on the suspending arms.

429.—Alfred Vincent Newton, of 66, Chancery Lane, in the co. of Middlesex, mechanical draughtsman, for "*An improved construction of water-meter.*" A communication. Patent dated Feb. 15, 1867.

In this improved water-meter two cylinders and sliding valves are employed, the valves working in a valve-chamber common to both of them, and all being arranged together in a box, in whose rear is placed the water-supply pipe. A crank-shaft, which is connected with the pistons by a yoke, gives motion through a worm and gear-wheel to a dial, which indicates through a fixed index the quantity of water discharged.

439.—William Hill and Henry Charles Wilberforce, both of the city of York, for "*Improvements in gas-cooking apparatus, and in steaming, baking, boiling, and roasting apparatus.*" Patent dated Feb. 18, 1867.

It is proposed to arrange a furnace or fireplace with a retort, hydraulic apparatus, condenser, and purifier, from which the gas to be used in cooking is caused to flow to the perforated bars, whether for roasting, boiling, or other operations. The spit is turned by means of clockwork springs wound up by a handle, or, in other instances, a weight may be the motive power. A basting-spoon or ladle is fixed on an endless chain (after the manner of a dredging-machine), which tilts the gravy over the meat during its revolutions caused by the clockwork movement. The steamer or boiler may be heated by means of a pipe inserted in a fire; the pipe being filled with water circulates steam or boiling water into the cooking apparatus. The chimney is cleaned by means of a circular brush suspended by an endless chain and pulley, and the brush being drawn upwards and downwards, thoroughly cleans the chimney from soot. The roasting apparatus is arranged in front of the fire, and the various pans for steaming or boiling are placed on and within the hot plate heated by gas or fuel. The arrangements of the stove are nearly the same as those in ordinary use for cooking by gas or other means.

444.—George Wenner, of Horwich, in the co. of Lancaster, civil engineer, for "*Certain improvements in apparatus for preventing 'down draught' in chimneys, which may also be applied for the purpose of ventilation.*" Patent dated Feb. 19, 1867.

This invention consists in the use and application of a curved "hood," or "cowl," into which the upper portion of the chimney-pot or funnel is made to project, such hood or cowl being open at the exit end, and turning with the wind on a vertical shaft, and has an opening in the back or long curve of a smaller sectional area than the area of the exit end of the cowl, and into this back opening a horizontal funnel or conical tube is fitted in order to catch the wind. By this arrangement the air is passed from the small opening in the back of the hood or cowl, over the top of, and at right angles to, the chimney or air-shaft, through the said hood or cowl of larger sectional area, expanding at the same time, and causing a great upward draught in the chimney or ventilating-shaft. To prevent any back current, the hood or cowl is made of sufficient length to allow the current of air which issues from the small opening in the shape of a cone to touch the sides of the cowl before passing into the open air, so that no air current can enter through the front opening.

449.—Henry Alder, of 32, Grange Road, Edinburgh, for "*Improvements in gas-meters.*" Provisional protection only obtained. Dated Feb. 19, 1867.

This invention relates to an improved mode of transmitting motion from the revolving measuring-drum of gas-meters to the indicating or counting mechanism, and consists essentially in substituting for the usual gearing employed for that purpose, a crank and connecting-rod, in conjunction with oscillating pallets, and an escapement-wheel similar to the escapement movement of a clock. The crank is fixed or formed on the spindle or axis of the drum, and the connecting-rod leads upwards to an escapement, working in an escapement-wheel, which forms the first or leading wheel to the index or mechanism. Each revolution of the drum in either direction communicates an impulse to the escapement-wheel, which is transmitted by the usual gearing to the several indicators.

458.—John Henry Johnson, of 47, Lincoln's Inn Fields, in the co. of Middlesex, gentleman, for "*Improvements in the application of certain hydrocarbons to the obtainment of light and heat, and in the apparatus or means employed therein.*" A communication. Patent dated Feb. 20, 1867.

This invention has for its chief object the utilization for the purposes of lighting and heating of those hydrocarbons which, by reason of their highly volatile nature, have hitherto been considered inapplicable (compatible with safety) to the purposes above referred to. One mode of utilizing these volatile hydrocarbons, or light mineral oils, consists in carburetting atmospheric air, by causing it to permeate several chambers, in which cotton or other suitable absorbent material saturated with volatile oil is contained, the air passing in a zig-zag or serpentine course through such chambers from the top to the bottom of the series, whence it issues in a condition fit for use, either as an illuminating or heating agent.

463.—George Haseltine, of 8, Southampton Buildings, Chancery Lane, in the co. of Middlesex, civil engineer, for "*An improved*

mode of and apparatus for letting on and shutting off gas, and igniting the same. A communication. Patent dated Feb. 20, 1867.

This invention consists in an improved apparatus for letting on and shutting off gas and igniting the same by means of electricity, two separate currents passing through independent wires being employed —the one to liberate clockwork which is connected with the valve or stop-cock of the burner, and the other to throw the spark which ignites the gas. The said invention also consists in surrounding the tip of the burner with a removable sleeve of non-conducting material for insulating the conducting wires; and furthermore consists in imbedding the wires through which the currents of electricity for lighting the gas pass, in a sleeve of non-conducting material which surrounds the tip of the burner or in the non-conducting tip itself, by which means the wires are firmly in place, and prevented from being thrown out of their proper position.

495.—William Edwin Heath, of 7, Pembroke Terrace, Chalk Farm, in the co. of Middlesex, for "*Improvements in gas-pressure governors.*" Patent dated Feb. 22, 1867.

The object of this invention is to procure a uniform supply of gas to burners and pipes or other appliances at all times, and under any excessive or fluctuating supply. To effect this object a chamber is prepared of a suitable size and shape, but by preference cylindrical, at the bottom closed partially, at the top open. On, or in the top edge of the chamber a deep annular groove is formed, and at the bottom of the chamber is introduced a conical shaped box or valve-case, from the upper edge of which is made a tripod or other shaped stay, which carries the guide for the spindle of the valve. The edge of this valve-case is turned of a true conical section, and the edge of the valve is made accurately to fit it when brought together. From the centre of the valve a rod or spindle is carried through the guide-stay, terminating in a screw carrying two nuts. A diaphragm of light metal or other substance is prepared with edges of the depth of the annular groove turned down all round. On the flat or upper surface of this diaphragm or cup is formed a series of grooves sunk in the surface, or raised for the purpose of giving rigidity or combining strength with lightness. This cup is varnished with one part resin and four parts beeswax.

The bottom of the apparatus is formed by a cup-plate fastened by screws to the bottom of the chamber, with a luting of white-lead or other suitable preparation. This cup-plate is made so as to confine the valve-case truly central in its place, and carries a screwed orifice in its centre for the admission of the gas. The cup is inverted and the rim placed downward in the annular groove, and it is confined in its place between the nuts and a leather washer, thus connecting it in all its movements with the spindle and valve. The groove is then filled with mercury to prevent the escape of the gas under the edges of the cup. A cover is made to fit over the top, so as to preserve the moving parts from injury, a hole in the centre allowing ingress and egress for the air in the working up and down of the cup. The valve, spindle, and diaphragm being made together equal in weight to a column of water of the desired height (but by preference six-tenths of an inch), and of the area of the under side of the cap or diaphragm, the apparatus is then fixed on the supply-pipes of the gas-main, and the gas turned into the apparatus. If the gas is supplied below the requisite pressure the valve remains inactive, presenting a full open passage for the gas; but as soon as the pressure is above that to which the instrument was first adjusted, it impinging on the under side of the cup with a greater pressure than the weight of that cup and valve together, floats or raises the cup, simultaneously closing the entrance.

498.—Henry Purnell, of Glasgow, in the co. of Lanark, N.B., engineer, for "*Improvements in motive-power engines to be worked by water, steam, or other fluid, and applicable to pumps.*" Patent dated Feb. 23, 1867.

This invention comprises as its principal features of novelty the employment of three single-acting cylinders oscillating or vibrating on trunnions or their equivalent, and the disposing of the inlet and outlet ports at that side of the trunnions, the tight or close fitting of which is insured by the working strain of the cylinder. This improved apparatus is also applicable for pumping.

499.—Arthur Kinder and William Barns Kinsey, both of 92, Cannon Street, in the City of London, engineers, for "*Improvements in gas-engines.*" Patent dated Feb. 23, 1867.

This invention relates to improvements in the general arrangement of gas-engines, whereby they are rendered more compact and portable, and the cylinders and other working parts are maintained at a more uniform temperature, by which means the inconveniences arising from unequal expansion and contraction are obviated. With regard to the general arrangement of the engine, it is proposed to place the crank-shaft between the cylinder and the slide-block, and to connect the piston-rod with the crank by bolting to the cross-head two forked side-rods or piston-rods, which work freely above and below the crank-shaft. These said rods or piston-rods are connected to the slide-block, and a connecting-rod is brought back from the slide-block to the crank, which works between the two side-rods or piston-rods. A uniform temperature of the cylinder is maintained by enclosing it in an open tank of water, through which a constant, or nearly constant, flow of water is maintained. The piston and piston rod or rods are both made hollow, and the latter is or are connected by a telescopic joint with a cistern or other supply of water, say the tank itself, in order that a free circulation of water may take place through the body of the piston and the piston rod or rods. When the cylinder is provided with the usual water-jacket, it is proposed to bring in the water by a direct attachment, in lieu of bringing it through a passage alongside of, and forming part of, the same casting as the eduction part, as heretofore, whereby the temperature of the water was considerably elevated before it could enter the water-jacket. In lieu of casting the usual S-shaped inlet and exit ports in the cylinder, it is proposed to make them straight, and to carry them direct into the cylinder at each end thereof, the slide-valve and valve-face being extended for that purpose. By this means greater facility is afforded for keeping down the temperature of the metal surrounding such parts by bringing it in contact with the water in the tank or jacket.

534.—Francis Vere Wright, of St. James's Place, in the city of Westminster and county of Middlesex, gentleman, for "*Improved adjustable reflectors for lamps and lighting purposes.*" (Complete specification.) Patent dated Feb. 27, 1867.

This invention consists in combining lighting jets or flames with reflectors that are provided with arrangements for adjusting their positions in such a manner that from time to time the position of such reflectors and lighting jets or flames may be adjusted or regulated, so that the light proceeding therefrom may be thrown in a particular direction or directions, or be still more generally diffused as required.

556.—Adolphe Gilbert Chalus, of 2, Rue Sainte-Appoline, Paris, in the empire of France, merchant, for "*Improvements in apparatus for producing artificial light from gas, air, and liquids.*" Patent dated Feb. 28, 1867.

In apparatus at present in use for burning gas an essential feature has always been omitted, and it is this—that gas escapes, and at times in a considerable quantity, from the burner without being consumed. The object of this invention is to remedy this defect. According to one arrangement of apparatus for this purpose a cap or obturator is placed on the top of the glass. It is made conical, and where its diameter is smallest it is provided with a surface to moderate the current of air and gas. The upper rim is pierced with holes to allow any excess of heat to escape, and to prevent the glass breaking; by this means all the gas passing through the burner is consumed, the light is white and much increased in intensity, and a great economy in consumption is the result. The same obturator is sometimes provided with ribs or grooves placed under its upper edge or rim, whereby the apertures may be dispensed with. By another arrangement the obturators are constructed with slits or circular apertures at the sides, so that the air may enter horizontally. By this means there is a current of air which itself burns and stops the evaporation of the gas which escapes from the glass. These obturators may have slits, holes, or other shaped apertures made in them as found most desirable, and their number varied as required. When made of porcelain there are formed in it three apertures, and it is in shape somewhat concave in the centre, in order to penetrate or dip somewhat into the glass, and the edges are fitted so that the obturator may be kept in the centre of the glass. When made of mica it is composed of a disc held in the chimney, which is also made of mica, by three parts riveted to the side of the glass between two pieces of copper. This obturator may be mounted on a metal ring by means of projecting pieces, and placed on the top of the chimney, whereby it may be placed there, and removed therefrom with great facility.

To procure good and economical combustion of gas by previously heating it, certain burners have been devised, in one of which the flame is reversed, and coming against the centre of a porcelain surface, having a spherical cup-like shape, which, while reflecting the light, acquires at the same time a high temperature, so that all the gas which reaches the burner is entirely consumed. In another arrangement, the burner is composed of two concentric cylindrical portions, having an annular space between them, to the upper part of which the gas is conducted by pipes. The gas issues through apertures formed midway, or nearly so, between the top and bottom of the external cylinder, so that the burner acquires a high temperature, and consequently perfectly consumes the gas as it escapes.

To remedy the defects arising from variations in the pressure of the gas, a regulator is employed, composed of an internal tube, with a seat at top and bottom, and carrying two valves, the inside surfaces of which are serrated, so as to allow at each point a passage for the gas, but the lower is straighter than the upper, in order that, should the pressure become too strong, the lower valve may rise and diminish the passage for the gas until the desired quantity arrives; or the regulator may consist of a hollow cylinder, in which there is a ball made of some light material free to move, which closes the interior of the tube. Conical grooves are formed in the tube to give the necessary space for the gas to flow. When the ball is at the lower part, without, however, being at rest, the gas passes easily by the grooves, but if, from an excess of pressure, the ball rises in the tube, the grooves being conical, and the gas being only able to pass by the grooves, it will diminish the passage for the gas, and consequently regulate the pressure.

To prevent inconvenience arising from the frequent breakage of ordinary chimney-glasses, the glasses are made in several parts, which are united at the upper and lower part by two metal wires, which surround it in a groove made for the purpose. These glasses are made with internal swellings to equalize the temperature in all parts.

560.—Stillman Boyd Allen and Jairus Handy Winsor, of the State of Massachusetts, U.S.A., for "*Generating heat by the admixture and combustion of a hydrocarbon vapour, air, and the gaseous components of steam.*" A communication. (Complete specification.) Patent dated Feb. 28, 1867.

According to this invention the steam is decomposed, and the gaseous products of such decomposition are introduced into a vessel with air and the vapours of a hydrocarbon, from which, by means of pipes and burners, the mixture is discharged in a state fit for combustion, and the production or generation of heat in consequence of such combustion. The invention is specially applicable for heating steam-generators, whether for stationary or locomotive steam-engines, or for such engines as are used on shipboard to aid in the propulsion of a navigable vessel.

563.—Alexander Angus Croll, of Coleman Street, in the City of London, civil engineer, for "*Improvements in the treatment of hydrocarbon oils, for the purpose of obtaining a permanent gas.*" Patent dated Feb. 28, 1867.

In order to obtain a permanent gas from liquid hydrocarbons, the liquid to be treated is placed in a close vessel surrounded by a steam-jacket heated by steam, by which, or by other suitable heat, the temperature of the liquid is raised to a boiling point and generates vapour. The vapour produced is conducted into contact with heated surfaces in a close chamber or retort highly heated, by which the vapour will be converted into a permanent gas, and may be conducted by suitable channels for use.

In carrying out these improvements, the liquid hydrocarbons selected to operate upon are such as may be vaporized at a temperature of 230° Fahr., but in using coal tar the temperature may be increased, limited only by the tendency of such matter to the development of naphthaline. It is preferred to conduct such liquid from a suitable reservoir by a pipe or tube into a first converting-chamber, which may be of the form of a horizontal boiler, the conducting-pipe or tube being introduced into this chamber at one end of it, and being supported in the interior thereof to near the opposite end, where the liquid hydrocarbon is allowed to flow into this first chamber, which chamber may be heated either by steam acting to the desired temperature in a surrounding jacket or otherwise. At the opposite end of this chamber to that of the supply thereto of the hydrocarbon liquid, and at the lower part thereof, there is an outlet-passage, from which may be drawn off the residuum of tar or other matter.

In carrying on the process with hydrocarbon liquid, such as coal tar obtained in the manufacture of gas from highly bituminous coal, which freely developes naphthaline, and in order to avoid such development of naphthaline during working, it is considered of importance so to control the heat to this first converting-chamber that the heat imparted to the contained liquid hydrocarbon may not exceed 230° Fahr. In working with other descriptions of coal tar not having such a tendency to develop naphthaline, the temperature may be increased until a useful quantity of vapour ceases to be produced, regard being had to the value of the remaining product. The vapour generated in this first converting-chamber is, by a simple outlet-passage, conducted therefrom into contact with heated surfaces in a close chamber or retort highly heated, or heated to an extent that such second chamber or retort will be of a red colour dimly visible in the dark.

Should the nature of the hydrocarbon for the time under operation be such that either a large or a less amount of heat may be found necessary in its treatment, then the useful heat to be employed may readily be ascertained by the following test:—When a deposition of solid carbon is formed in the passage of the gas from the decomposer or heated chamber or retort, too much heat has been employed, and it must be reduced. When there is condensation of a considerable portion of liquid hydrocarbon, too little heat is being employed, and it must be increased. The gas obtained by these means may either be used alone or in combination with coal gas. When used in the manufacture of coal gas, it will enable the manufacturer to obtain an increased produce of gas from the coal used, or to employ coal of an inferior quality, whilst the illuminating power of the coal gas obtained will be increased by such admixture. And in order to obtain the best results from the combination of the two gases, it is preferred to mix them at a point between where the coal gas passes from the ordinary condensing apparatus to the purifiers. The proportion of one gas to the other will depend on the extent of distillation of the coal or the amount of illuminating power desired to be obtained, but, as a general rule, it will be found that the addition of 1½ to 2 per cent. of the hydrocarbon gas thus obtained, mixed with the coal gas, will increase the illuminating power of the gas by 1 candle in every 5 feet of gas consumed.

565.—James Harbert and Frederick Goodman, both of Kidderminster, in the co. of Worcester, for "*Improvements in destroying explosive gases in coal and other mines, in order to render them safe for the miners to enter.*" Patent dated Feb. 28, 1867.

According to this invention, explosive gases are destroyed in the most distant workings of coal and other mines, by igniting and exploding any accumulations of such gases by currents of electricity or by other suitable means. For this purpose it is proposed to convey such currents to the desired places by means of suitable conductors from a galvanic or other battery placed at a suitable distance interior or exterior of the mine. At the part or parts of the mine where it is desired to cause an explosion of gas or fire-damp to take place, the conductors of electricity are connected by a piece of platinum passing through or into a fusee or other explosive compound or material, so that, when the electric current is formed by connecting the opposite poles of the battery, the piece of platinum will become heated or fused, so as to ignite the explosive or inflammable material connected therewith, and thus cause the gas in the locality to explode. By causing such explosions to take place at the "head" or extremity of the workings, the foul air and gases will be driven out towards the main shaft or entrance to the mine, after which the passage of atmospheric air into the workings will soon render the same safe for the miner to enter. Mechanical, chemical, or other means may be resorted to for the purpose of producing and causing accumulations of noxious gases to explode in distant parts of a mine; for instance, detonating or other substances may be ignited or exploded by percussive force brought into action by electro-magnetism or by other means when desired.

571.—Alfred Vincent Newton, of 66, Chancery Lane, in the co. of Middlesex, mechanical draughtsman, for "*Improvements in steam and gas engines.*" A communication. Patent dated Feb. 28, 1867.

The object of this invention is to economize fuel in steam and other motive-power engines, more particularly to save, as far as practicable, the heat which is radiated and conducted away from the metal of the cylinder, when the steam or heated gas is escaping after having done its work. This is accomplished by constructing the interior surfaces of the cylinders of steam and gas engines of a material which conducts heat less freely than that usually employed, and, when the wearing surfaces cannot be conveniently made of such material, the cylinder and piston are so formed that the main portion of the steam or gas is not exposed to direct radiation from such wearing surface.

577.—Walter Christopher Thurgar, of the city of Norwich, surgeon, for "*Improved means or apparatus for regulating the supply of gas to burners.*" Provisional protection only obtained. Dated March 1, 1867.

This invention relates to peculiar means and construction of apparatus, consisting conjointly of clockwork, levers, and springs, by which the raising and lowering of the flame in gas-burners is accomplished. The main object of the invention is to keep the gas always burning, and so that it will be increased or decreased at the proper times, without manual aid, for a given time, say seven days. A dial is fixed on the apparatus to regulate the times of full and slight illumination, which are caused by a frictional lever working on a wormed cylinder conjointly with a spiral spring contained in the same, by which, at a given time, the gas is lowered to a nominal light—viz., a small blue flame; while at the same time, by acting upon levers, a shield is raised which effectually protects the small light from wind or draught. The wormed cylinder is held in a certain position during the hours of non or slight illumination by means of a disc and catch, which, at a given time, leave hold, and allow the wormed cylinder to return to its place and perform a rotary motion during the hours requiring full illumination. This is regulated by the dial and a rack, slide, and pinion acting upon the end of the wormed cylinder, the said dial allowing the time of full illumination to be from one to sixteen hours, as occasion may require. A dial placed on the front gives the mean time, and this is regulated by the clockwork of the apparatus. The other dial placed inside the frame to regulate the time of illumination can be adjusted by means of a double cam-stop wheel working on the face of a sixty-minute catch-wheel, and acting upon levers of a double clutch and segment, to any length of time, as circumstances may require. The wheel is held fast in its place by means of a ratchet-spring and catch; the segment acts upon levers, which at the same time act upon each other and expose the gas-burner, and the gas is turned on by a double-clutch spring barrel and catches, which, being acted upon by the double cam-wheel, give the necessary rotating motion to the segment for lifting the levers.

579.—William Parry, of Birmingham, in the co. of Warwick, mineral surveyor, and John Frearson, of Birmingham aforesaid, mechanical engineer, for "*Improvements in treating or purifying sewage, and in apparatus to be used for that purpose.*" Provisional protection only obtained. Dated March 1, 1867.

These improvements in treating or purifying sewage consist in mixing therewith, in a certain manner, clay, iron ore, or manganese earths, whereby the suspended or dissolved organic and inorganic matters contained therein are precipitated, and the water of the sewage rendered clear and inodorous, or nearly so.

583.—Max Gossi, of 11, Rue des Peignes, Antwerp, merchant, for "*Improvements in transporting, warehousing, and barrelling petroleum oil or liquids lighter than water.*" Patent dated March 2, 1867.

In order to obtain complete insulation of the cases or recipients made of iron, sheet zinc, wood, or other material, in which petroleum is preserved, and which may be either square, round, or otherwise, basins of any depth, size, and form are constructed in brick or earth, containing sufficient water to submerge all the cases. Above the surface of these basins, and at a sufficient height, are placed bars or beams in iron, wood, or other material, crossways. At the junctions or elsewhere (all these bars forming a grate) are fixed uprights or columns provided with four angle or corner guides from top to bottom. At the top these uprights are sustained by the bars of the grate; underneath they are fixed in the masonry or other pavement of the basin, either to a grate identical to that at the top, or to sleepers. These uprights or columns serve also to support the bars at the top, making a kind of open flooring on which a crane or hoisting-machine can work to lift weights to carry them to any point of the surface of the basin. The uprights or columns thus form four guides between which the cases, which are made to correspond in size to the distance between the guides, can slide. By lowering into the water between each four guides cases filled with petroleum, they can be submerged. They will sink by their own weight if they are heavier than their volume of water, or otherwise ballast is added. Each single case, or all the cases superposed between each four guides, from the bottom to the surface of the water, and thus submerged, are kept down by a spring-catch or other means. In order to bring to the surface of the water the cases which are between four guides, it is only necessary to detach or open the catch or instrument which holds them down. If their weight is not lighter than water, they are assisted to rise by a counter-weight.

591.—John Ambrose Coffey, of 32, Great St. Helen's, in the City of London, consulting engineer, for "*Improvements in self-acting steam and fluid safety-gauges, the said improvements being applicable to cocks or taps and valves.*" Patent dated March 2, 1867.

With the view to avoid the valves of gauges closing without breakage of the glass tube, from the rolling of the ship or concussion of shot, in lieu of the valves arranged horizontally in the ducts between the cock and the boiler, a vertical valve and seating are used in the interior of the cock or tap itself; that is to say, in the body of the key-plug, or stopper of the cock or tap, is formed a seating for an upright spindle-valve, with the seating placed midway between the inlet and outlet of the gauge-cock before mentioned, so as to effectually stop or open the communication between the interior and exterior of the boiler or vessel having pressure upon it. This valve by its guides (the top and bottom spindles), for which due play must be provided,

remains open by its own gravitation under ordinary circumstances, but, when the glass tube breaks, the pressure from the boiler or vessel is sufficient to close the same, and shut off all external communication. In vacuo, by reversing the action of the valves, it will be obvious that the effect will be precisely the same from the external instead of the internal pressure. Thus, instead of using a solid key, plug, or stopper, for the cocks or taps of the said steam or liquid gauges, a key, plug, or stopper is used, in the body of which is a hollow part or valve chamber or chambers, which is or are in direct communication with the inlet and outlet ducts, with a seating or seatings for a spindle or other valve or valves, fitted free to work in the said key, plug, or stopper, and by the said spindle or other valve or valves the said hollow part, chamber, or chambers, is or are subdivided into parts opened into or shut off from each other by the aforesaid spindle or other valve or valves. Two or more of these subdivisions should have openings into them through the key, plug, or stopper for the steam or fluid ways, and also air or pressure openings if necessary. When in action this construction keeps the valve or valves open, but when the glass or tube of the gauge becomes broken, the pressure being then too great on one side of the valve or valves, it or they thereby become closed. Upon turning the key, plug, or stopper, so that the ways of the same are shut off, the action becomes identical with that of an ordinary key, plug, or stopper.

597.—William Edward Gedge, of the firm of John Gedge and Son, of 11, Wellington Street, Strand, in the co. of Middlesex, patent agent, for "*Improvements in privies or water-closets.*" A communication. Provisional protection only obtained. Dated March 4, 1867.

The object of this invention is to secure the cleanliness of the seat, to render it more accordant with the requirements of the human frame than ordinary seats, and to prevent the necessity of using a large quantity of water, which decreases the value of the deposit as manure. The seat is composed of two boards or slabs, inclined at an angle of about 30°, about 4 inches broad and 16 inches long. These two boards alone constitute the seat or fulcrum, and are separted from each other by a space of about 8 inches. The pan is fixed to these boards by four cheeks; it may be of enamelled cast iron, porcelain, or other material; it is of an ovoid shape, and with an upward and inward curve at the two ends.

608.—Henri Ulliel, of the Avenue de Neuilly, in the department of Seine, France, manufacturer of gas apparatus, for "*Improved apparatus for artificial light and heat.*" Patent dated March 5, 1867.

This improved apparatus consists of appliances for effecting the combination or saturation of aëriform or gaseous currents with hydrocarbons, or any fluid containing or combining carbon of suitable nature, whether in a normal or volatilized state. The result of this saturation by these means is the emanation of a new gaseous product of improved quality, and economical in regard to cost and consumption.

621.—John Garrett Tongue, of the firm of Tongue and Birkbeck, patent agents and engineers, of 34, Southampton Buildings, Chancery Lane, in the co. of Middlesex, for "*Improvements in steam-engines and pumps.*" A communication. Patent dated March 6, 1867.

The nature of this invention consists in enclosing a revolving crank and its operating pitman (which connects with a piston working in a cylinder open at its one end) within a steam or water tight box, preferably of a form corresponding to the travel described by the pitman, whereby a rotary motion may be obtained through a long connecting-rod in a short space or compass, and a piston-rod is dispensed with; also, in combination with the foregoing, in pivoting the pitman to the piston within the body of the latter, at or about the middle of its thickness, to the reduction of lateral pressure or thrust upon this piston, and still further enhancing the compactness of the pump or engine for a given length of connecting-rod.

624.—John Thompson, of Nettlebed, in the co. of Oxford, stoneware manufacturer, for "*Improvements in the manufacture of gas.*" Provisional protection only obtained. Dated March 6, 1867.

For these purposes, in place of having gas-retorts heated externally by their being set in a suitable furnace as heretofore, they are, according to the present invention, whether in a horizontal or an upright position, to be heated by internal flues or passages, through which highly heated air or steam is caused to flow, so as to heat the passages or flues, and, consequently, the coal or like gas-making material placed in the retorts, but external of the flues or passages placed within or formed through the retorts. The retorts may, with advantage, be set in or surrounded with sand or other suitable non-conducting material. The air or steam used for the purpose of the invention is to be passed through heating apparatus similar to what is employed in obtaining highly heated air, and highly heated steam employed in various ways. When the gas has been extracted, the flow of heated air or heated steam is to be shut off, and the steam is then to be allowed to flow into the interior of the retorts, and amongst the coke therein, by which not only will the remaining gas be driven off from the retorts, but the coke will be quickly brought into a condition to admit of its being withdrawn from the retorts. The gas, when it passes off from the retort, is passed through the purifying processes ordinarily employed in the manufacture of coal gas.

631.—Charles William Siemens, of 3, Great George Street, Westminster, in the co. of Middlesex, for "*Improvements in apparatus for measuring water, alcohol, and other fluids.*" Patent dated March 7, 1867.

The present improvements have for their object so to construct fluid-meters that their accuracy shall not be impaired by the contraction of or obstructions in the inlet passages due to deposits from the fluid. For this purpose, in one arrangement, a spindle connected to the counter of the meter is provided with a number of vanes or blades situated inside a cylindrical chamber. In the sides of this chamber, on a level with the vanes, are a number of comparatively large oblique openings, through which the fluid passes; such fluid entirely fills the chamber, and by its oblique action on entering causes the whole of the fluid contained in the lower part of the chamber to revolve, which is thereby made to carry with it the vanes, and thus cause the spindles to rotate. The outlet orifice of the chamber is in the upper part thereof, and as the fluid passes up towards it, its rotation is checked by a series of stationary vanes projecting from the sides of the chamber, which vanes are capable of adjustment so as to regulate somewhat the speed of rotation of the lower body of the fluid. In order to equalize the speed of rotation of the lower vanes, according to the quantity of fluid passing through the meter, other rotating vanes are fixed to the spindle in the quiescent fluid above the stationary vanes, whereby any tendency to an increase of speed of the lower vanes disproportionate to the increase of the flow of the fluid is counteracted by the increased resistance to rotation afforded by the upper vanes.

633.—Alphonse Louis Normandy, of 17, New Park Road, Stockwell, in the co. of Surrey, engineer, for "*Improvements in engines worked by heated air, and by other suitable heated gas or gases.*" Patent dated March 7, 1867.

This invention consists, first, in the construction of reciprocating engines worked by heated air, or other heated suitable gas or gases, in such a manner that the heated air, or gas, actuates pistons arranged and operating substantially on the improved plans described.

Second, in the construction of engines worked by heated air, gas, or gases wherein the air or gas is caused to enter the lower inverted buckets of a bucket-wheel or chain of buckets immersed in melted lead, or other suitable heated fluid, so as to produce the rotation of such bucket-wheel or chain or buckets by the buoyancy of the air operating during its expansion in the buckets due to their ascent in the fluid.

Third, in regulating the power and speed of improved engines, as described in the first part, by means of a graduated cam actuating the valve for admitting the heated air, gas, or gases, so as to close it and cut off the supply to the piston at the right joint, the quantity of air, gas, or gases supplied by the pump being at the same time regulated by its own pressure, so that the working pressure may remain nearly constant.

Fourth, in regulating the power and speed of improved engines, as described in the second part, by means of a throttle-valve and reservoir, the quantity of air, gas, or gases supplied by the pump being at the same time regulated by its own pressure, so that the pressure may remain nearly constant.

Fifth, in constructing improved engines, as described in the first and second parts, so that the hot discharged air, gas, or gases become cooled by means of a cooling current of air, and again compressed by the air-pump, the cooling current of air being at the same time employed to consume the fuel and to regulate the intensity of the heat from the furnace by being discharged below and above the fire, the total quantity of the cooling current, and the relative quantities of it discharged below and above the fire being also regulated by dampers.

641.—Paul Rapsey Hodge, of 106, Cannon Street, in the City of London, civil engineer, for "*Improvements in hydraulic motors.*" Patent dated March 7, 1867.

This invention relates to certain improvements in that class of hydraulic motors known under the name of "turbines." The objects attained by these several improvements are—first, in the arrangement of a duplex turbine somewhat in the form of Jonvill's single turbine, by placing one of the single turbines above and the other below the casing on a vertical axis, so that the upward pressure due to the head or fall of the upper turbine counterbalances the downward pressure on the lower turbine, thereby taking away any undue amount of pressure from the step of the shaft.

Second, in arranging duplex turbines with a Jonvill turbine below and a Fanneron turbine above, doing away with the necessity of keeping the turbine immersed in water, so that the line of the upper force of the turbine is out of the water, which is not the case in the preceding example.

Third, the combining and arranging duplex turbines on a vertical axis, as before, and placing one above and the other below the casing, the upper one being an inverted Fanneron turbine, the lower one being the same but not inverted, the one turbine counterbalancing the other by such compound arrangement, thereby taking the pressure off the step of the vertical shaft.

Fourth, by constructing a single turbine with a counterbalance chamber and plate, so that the upward pressure on the lower side of the turbine compensates for the downward pressure on the upper side, thereby also taking the downard pressure off the step.

Fifth, in arranging such turbines and attaching thereto a separate working hydraulic column, so that the water entering such working column shall pass through and be regulated by counterbalanced valves or sluices acted upon by a governor, so that whatever load there be on the wheel or motor, the governor will regulate the amount of water to flow into the working column through the sluices or valves to be equal to the quantity of discharge through the wheel, sufficient to effect the given force necessary for the load on the wheel, and when the load is increased the governor or regulator will open the sluices or valves, letting more water into the working column, and raising the hydraulic head equal to the increased load.

650.—William Young, manager of the Oil-Works, Straiton, in the co. of Mid Lothian, N.B., and Peter Brash, of Leith, in the same co., soap, candle, and oil manufacturer, for "*Improvements in the distillation of bituminous substances.*" Provisional protection only obtained. Dated March 7, 1867.

This invention has for its object improvements in the distillation of coal, shale, and other bituminous substances, in order to obtain oily matters therefrom, and consists in effecting the distillation by means of vapours or gaseous bodies in the mode hereinafter described. As a readily available application, it is preferred to use the hydro-

carbon gases given off from the bituminous matters themselves under treatment. The bituminous matter to be distilled is enclosed in a vessel or chamber provided with an outside casing which is to contain the gases or vapours. Heat is applied to this outside casing, and is diffused through that to the inner chamber containing the bituminous matter. The gases or vapours are then, by a suitable pipe at the bottom, introduced between the outer casing and the inner chamber, and after ascending they are forced or drawn into a downward current through the bituminous matter, carrying with them the oily vapours, thus effecting a downward distillation which produces an oil of high quality, yielding a larger quantity of solid paraffin than is obtained from oil produced by any other known mode.

686.—William Bryer Nation, of 394, Old Kent Road, in the co. of Surrey, for "*Improvements in apparatus for raising, forcing, propelling, and exhausting fluids and gases.*" Provisional protection only obtained. Dated March 11, 1867.

The apparatus consists of an elastic and compressible pipe or tubular passage, communicating at one end with the supply-pipe for the fluid or gas, and at the other end with the delivery-pipe, which tubular passage is acted upon in succession by two or more rollers or presses, so arranged as to travel along on the outside of the said passage, at the same time compressing it, and thereby forcing the fluid or gas contained in the passage before it towards the delivery-pipe. As the one roller or presser passes along, that part of the passage over which it has passed, opens out again by virtue of its elasticity, and becomes again filled with the fluid or gas, and when the one roller or pressure arrives near the delivery end of the passage, another roller commences to pass over and compress the same near the supply end, and so on continuously, each roller or presser being made successively to force the body of fluid or gas in the passage along the same to the delivery end, and to keep the passage compressed until another roller has commenced compressing it at the supply end.

690.—Joseph Pearson of Birmingham, in the co. of Warwick, brass-finisher, for "*Improvements in ball or supply valves.*" Provisional protection only obtained. Dated March 11, 1867.

This invention relates to valves of the kind commonly called ball-valves or supply-valves—that is to say, valves ordinarily employed to keep water and other liquids to nearly the same level in cisterns and reservoirs, the opening and closing of the valve being effected by a ball or float on the water or other liquid. According to this invention, the entrance-pipe of the valve is situated vertically, and terminates in a barrel of larger diameter. The axis of the barrel is in the line of the axis of the entrance-pipe. The entrance-pipe projects a short distance into the barrel, and its end constitutes a horizontal valve-seat. The barrel is open at bottom, and has a horizontal slot at about its middle. In the barrel a cylindrical plug is situated, which is capable of rising and falling. The top of the plug is covered with a washer of leather or other packing. When raised its top bears against the valve-seat, and the flow of water or liquid is arrested. When it is lowered from the valve-seat, the water or liquid passes down between the inside of the barrel and the sides of the plug. In order to facilitate the flow of liquid the plug may be flattened on two opposite sides. Through the middle of the plug a slot is made, and an arm or lever passing through this slot, and that in the barrel, is jointed at one end to the outside of the barrel, and carries at its other end a ball or float. When the ball-valve described is in use, the rising of the ball or float closes the valve, and the sinking of the float opens it. In order to prevent or diminish the escape of liquid by the slot in which the arm or lever works, a shield may be fixed round the slot.

692.—Edward Thomas Hughes, of the firm of Hughes and Son, of 123, Chancery Lane, London, patent agents, for "*An improved apparatus for the promotion of economy in the combustion of gas, petroleum, and other oils.*" A communication. Provisional protection only obtained. Dated March 11, 1867.

This invention consists of an apparatus to be placed over the top of the chimney or globe used in the combustion of gas or oil, which apparatus, by preventing the too rapid exit of the gas, causes a great saving in the quantity thereof consumed, at the same time improving the combustion and giving a better light. The apparatus consists of a cap with its lower part expanded, and having near its apex and parallel to its lower extremity two rows of circular apertures for the exit of the air entering the globe or chimney. Attached to the bottom of the said cap is a circular plate turned down towards the centre, leaving a circular opening therein. On the exterior surface of the said plate are three ribs or projections, upon which ribs the apparatus rests on the top of the chimney or globe.

702.—Thomas Burt, of Wandsworth, in the co. of Surrey, civil engineer, for "*Improvements in machinery and apparatus for moving mud, sewage, sand, small gravel, or other similar matter from one place to another.*" A communication. Patent dated March 12, 1867.

This invention consists in the employment of a steam-dredger, to which is applied, in order to receive the material raised, an apparatus formed by fitting two or more vanes upon a vertical shaft; these vanes are partially enclosed in a cylindrical case, having an outlet formed at one side, and a valved inlet at top and bottom. To the top cover of the pump there is fitted a cylinder or receiver, into which the mud or other matter to be removed is thrown by the dredger. To the bottom of the pump case there is fitted a pipe for admitting water. The quantity of mud, sand, or other matter and water admitted into the case or body of the pump is regulated by opening and closing the valves before mentioned. The pump may be worked by steam or other power. As the mud, sand, or gravel is admitted at the top, the water is admitted at the bottom of the pump-case, and the materials are thus mixed and driven out through the side opening before mentioned.

708.—John Fox, of West Hackney, engineer, for "*Improvements in filters.*" Patent dated March 12, 1867.

The object of this invention is to construct an apparatus which not only effectually filters water or other fluids, but prevents the entry of a considerable portion of those foreign matters usually held in suspension in water, and thereby obviate that rapid fouling of the filtering medium which takes place in other filters. The apparatus is so constructed that it shall float on the surface of the fluid to be filtered, and, when desirable, it may form a lid or cover to the vessel containing the liquid. The upper portion of the apparatus consists of an air-tight double case or float, made of any suitable material, the lower part of which contains the filtering medium, having a moveable bottom, which is perforated with small holes to admit of the fluid to be filtered passing through it; whence it finds its way into the lower compartment of the vessel in which the apparatus is placed, through a conical tube on the outside thereof. The filtering medium which it is preferred to employ is animal charcoal.

APPLICATIONS FOR LETTERS PATENT.

3155.—Joseph Wontmer Smith, of 20, Tenter Street, engineer, and Tony Petitjean, of 26, John Street West, chemist, both in the co. of Middlesex, for "*Improvements in warming, ventilating, and heating apparatus.*" Nov. 8, 1867.

3158.—Sibbit Landells, of 33, High Street, Gateshead, in the co. of Durham, for "*Improvements in the manufacture of glass globes and other hollow forms for gaseliers, chandeliers, candles, lamps, and other similar purposes.*" Nov. 8, 1867.

3171.—Mark Rollason, of Birmingham, in the co. of Warwick, modeller, for "*Improvements in suspended gas-lamps.*" Nov. 9, 1867.

3172.—Thomas Wells Ingram, of Birmingham, in the co. of Warwick, manufacturer, and Edward Curtis Kemp, of Birmingham aforesaid, manufacturer, for "*Improvements in gas-lamps.*" Nov. 9, 1867.

3179.—William Payne, of Birmingham, in the co. of Warwick, engine-fitter, for "*Improvements in clack and bucket door pieces for pumps.*" Nov. 11, 1867.

3219.—Alfred Vincent Newton, of 66, Chancery Lane, in the co. of Middlesex, mechanical draughtsman, for "*Improvements in rotary engines applicable as motors, pumps, meters, and for other purposes; also in indicators applicable to such and other engines or meters, and other purposes.*" A communication. Nov. 13, 1867.

3225.—Richard Harrison, of 7, Sackville Place, in the city of Dublin, brassfounder, for "*Improvements in cocks or taps.*" Nov. 14, 1867.

3228.—Levi Alfred Wainman, of Leeds, in the co. of York, engineer, for "*Improved apparatus for raising water.*" Nov. 14, 1867.

3237.—William Edward Gedge, of the firm of John Gedge and Son, of 11, Wellington Street, Strand, in the co. of Middlesex, patent agent, for "*An improved gas-engine.*" A communication. Nov. 15, 1867.

3245.—Richard Howson, of Middlesborough-on-Tees, in the co. of York, engineer, for "*An improved gas-furnace.*" Nov. 15, 1867.

3304.—Ebenezer William Hughes, of Queen Square, Westminster, for "*Improvements in rotary engines and pumps.*" Nov. 21, 1867.

3305.—Henry James and Edward Drewett, of Weybridge, in the co. of Surrey, for "*Improvements in water-closets.*" Nov. 21, 1867.

GRANTS OF PROVISIONAL PROTECTION.

2045.—Frederick Wilkins, of 20, York Buildings, Adelphi, in the co. of Middlesex, civil engineer, for "*Improvements in apparatus for producing or increasing the light or heat from carbonized atmospheric air, gas, or gaseous mixtures, by the use of hydrocarbons, oils, spirits, or other inflammable liquids, or any mixture thereof.*" July 12, 1867.

2989.—George Olney, of the city of Brooklyn, in the state of New York, U.S.A., gas engineer, for "*Improvements in the manufacture and storing of illuminating gas, and in apparatus employed therein.*" Oct. 24, 1867.

3050.—Loftus Perkins, of 6, Seaford Street, Gray's Inn Road, engineer, for "*Improvements in actuating the valves of water and other meters, and of engines for obtaining motive power.*" Oct. 29, 1867.

3061.—Robert Clegg, of Islington, in the co. of Middlesex, engineer, for "*Improvements in the construction of pumps.*" Oct. 31, 1867.

3084.—John Scott, of 20, Westmoreland Place, City Road, in the co. of Middlesex, mechanical draughtsman, for "*Improvements in shades for gas and other lamps, and in the mode of fitting or applying the same.*" Nov. 2, 1867.

3158.—Sibbit Landells, of 33, High Street, Gateshead, in the co. of Durham, for "*Improvements in the manufacture of glass globes and other hollow forms for gaseliers, chandeliers, candles, lamps, and other similar purposes.* Nov. 8, 1867.

3171.—Mark Rollason, of Birmingham, in the co. of Warwick, modeller, for "*Improvements in suspended gas-lamps.*" Nov. 9, 1867.

3172.—Thomas Wells Ingram, of Birmingham, in the co. of Warwick, manufacturer, and Edward Curtis Kemp, of Birmingham aforesaid, manufacturer, for "*Improvements in gas-lamps.*" Nov. 9, 1867.

NOTICES TO PROCEED.

1937.—William Galloway and George Plant, both of Manchester, in the co. of Lancaster, for "*Improvements in the manufacture of welded tubes, and in apparatus employed for that purpose, which latter are partly applicable to other purposes.*" July 3, 1867.

1978.—Thomas Caless Thomas, of Banbury, in the co. of Oxford, cutler and gas and water fitter, for "*Improvements in water-closet fittings.*" July 6, 1867.

1984.—William Archer, of Birmingham, in the co. of Warwick, coach-builder, for "*Improvements in rotary engines and rotary pumps.*" July 6, 1867.

1986.—John Clarkson Major, of Wolverhampton, in the co. of Stafford, manufacturing chemist, for "*Improvements in furnaces for the production of heat by burning tar, petroleum, and other liquid combustibles, and in the mode of conducting the burning of the said combustibles.*" July 6, 1867.

2130.—James Hooper, of Moseley, in the co. of Worcester, plumber and glazier, for "*Improvements in ventilators.*" July 20, 1867.

2179.—William Edward Newton, of 66, Chancery Lane, in the co. of Middlesex, civil engineer, for "*An improved water and gas meter.*" A communication. July 27, 1867.

2847.—Richard Brotherton, of Wolverhampton, in the co. of Stafford, wrought-iron tube maker, and Joseph Waldron, of Wolverhampton aforesaid, wrought-iron tube maker, for "*Improvements in the manufacture of lamp-posts.*" Oct. 10, 1867.

3332.—John Young, of Aspull, in the co. of Lancaster, for "*Improvements in the application of cannel coal 'slack' to the manufacture of gas and coke.*" Oct. 28, 1867.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

2633.—Hyde Bateman and Edward Gooch Garrard, "*Improvements in the construction of pumps.*" Oct. 24, 1864.

2702.—Isaac Schwartz, "*Improvements in apparatus for lighting rooms and buildings.*" Nov. 1, 1864.

2734.—Frederic Yates, "*Improved apparatus for generating combustible gases.*" Nov. 4, 1864.

2751.—William Thritt, "*An improved rotary-engine pump or blast.*" Nov. 7, 1864.

2761.—Charles Thomas Burgess, "*Improvements in portable centrifugal pumps.*" Nov. 7, 1864.

2766.—Richard Rimmer, "*An improved apparatus for drawing off liquids.*" Nov. 8, 1864.

2770.—Charles Garton, "*Improvements in obtaining power from liquids.*" Nov. 8, 1864.

2836.—Robert Harlow and William Jolley, "*Improvements in cocks and valves.*" Nov. 14, 1864.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

2781.—William Roberts, "*Improvements in pumps.*" Nov. 13, 1860.

2826.—George Glover, "*Improvements in apparatus used in measuring gas.*" Nov. 16, 1860.

Miscellaneous News.

METROPOLITAN BOARD OF WORKS.

MR. DOULTON AND THE CONTRACTORS.

A Special Meeting of the Board was held at the Office, Spring Gardens, on Wednesday, Nov. 20—"To consider the statements contained in the proceedings in the Bankruptcy Court, in the matter of Mr. Furness," one of the contractors for the Thames Embankment Works.

Sir John Thwaites, on taking the chair, said, seeing the honourable member for Lambeth (Mr. Frederick Doulton, M.P.) in his place, he would just state that a printed copy of the evidence given by Mr. Furness had been sent to every member of the board. The honourable member, of course, had received a copy of that evidence, in which certain statements were made affecting himself. The board had been specially called together on this occasion for the purpose of hearing the explanations which the honourable member, in a letter addressed to the board a short time ago, expressed a desire to make in reference to those statements. Before doing so, however, he (the chairman) wished to call the attention of the members generally to page 21 of the evidence, which related to some transactions in Odessa. Mr. Furness stated that a bill in Chancery was filed against himself and Mr. Bazalgette in reference to that matter, and that there was a great disturbance at the board in consequence of it; that the case of Mr. Bazalgette was taken up by the friends of Mr. Ridley, who had tendered at a lower price for the works of the Thames Embankment, but was not accepted; and that ultimately Mr. Bazalgette and the chairman of the board wrote him a letter, which was sent through Sir John Rennie, in which it was proposed that he (Mr. Furness) should pay Mr. Bazalgette all his expenses, and that Mr. Bazalgette should receive no commission from him. On reading over the evidence, he (the chairman) was utterly astounded at that statement, because he had never written a letter of any description, nor had any communication with Mr. Furness on the question. He had, therefore, directed his secretary to write to Mr. Furness to ask for an explanation, and Mr. Furness had replied as follows:—"There must be some mistake. I never had the opportunity of correcting or seeing the evidence as to whether it was accurate. I could not have said that I received such a letter from the chairman. The letter referred to of the 26th of November was Mr. Bazalgette's letter declining any participation in the commission received in that business. That was directly after the board thought he should disclaim at once any participation in the matter" and the letter was handed over to Mr. Furness, releasing him from the liability to pay Mr. Bazalgette part of that commission. He felt it due to himself to state this, that the board might know at once that he had written no letter or had any part in the transaction. If the honourable member was now desirous to make a statement to the board, they would be glad to hear him.

Mr. F. Doulton: Sir, the observations which I feel called upon to make today will be very brief, but I trust they will be very intelligible. In the first place, I desire to tell the board that my absence from the meeting on Friday was not occasioned by any disinclination on my part to attend and give the explanation asked, nor from any inability to answer, as I believe satisfactorily, all the statements which have been made. Nor was my absence occasioned by any disrespect to my colleagues, it was simply a question of impossibility, with regard to other matters in which I was engaged, to be present then, or I should have been here to have given the same explanation that I am now prepared to give to-day. The course which I have taken in reference to this matter is one that appears to me, upon reflection, not only to have been a ligitimate course—a proper course—but the only course which was open for me to take. On the 9th of October I first heard of even the slighest whisperings in relation to this matter, and what I then heard was of the very vaguest character. But upon that day, within a very few hours after I had heard it, I wrote to the solicitors who had been connected with the examination, and asked them first to give me a copy of the evidence taken, and in the next place I asked that they would afford me an opportunity of giving my answer in the same place and before the same tribunal as that in which the statements were made. Owing to the absence from town of the principal of that firm, I received no reply until the 1st of the present month, and I was then informed that possibly there would be no objection to my having a copy of the evidence given, but that there was—to use his own words—"I do not see any mode of giving such a reply as you wish in the Court of Bankruptcy;" and he added these words—"I do not know how the question has come before the board at all." He was evidently ignorant of what an amiable colleague I had when he said that. What was I to do, sir? I could only wait till I obtained the evidence upon which these statements were made, and I obtained that evidence in common with every other member of this board on Tuesday last, or rather yesterday week. Until that day I had not seen any evidence—I had only heard, as I have said, in the vaguest terms what was the nature of the statement which had been made. On the same day, again, that I received that copy of the evidence, I personally saw the chairman of the board, and told him it would be impossible for me to be present on Friday last, and requested that the whole matter might be referred to a committee, in order that the committee might investigate it and report to the board—not a select committee of five, but a committee of the whole board—that being a course which has been usually taken—I will not say in reference to matters of this particular kind, but in reference to matters in which questions of character may and will arise. It was brought before the board. The board on Friday last thought it was not wise to agree to the request I had made. I have not one word to say in the way of objection as to the decision at which the board has arrived. What I do object to is that when a question arose—a mere question as to whether or not this matter should be referred to a committee—there were certain members of the board, whom I shall have occasion to refer to personally, who took the opportunity, although carefully not endorsing the statements and charges which have been made, yet by implication undoubtedly asserting their truth. Sir, I think—I am sure, in fact—that it was very simple of me and very foolish of me to make even such a suggestion as that this matter should be referred to a committee. In every community—and this board is not exempt—there is a class of persons who, when they can obtain a little scandal, will "roll it under their tongues like a sweet morsel;" and I might have assumed, had I thought of one or two members of this board, that to propose a reference of this character to a committee would be taking away from them an opportunity, which heretofore they have not been slow to avail themselves of, to endeavour to damage my public character, when, as I shall be able to show to-day, there is not the slightest foundation for it; in fact, there are some few members of this board who, for some years past, in relation to myself, have acted upon this principle, that if they only threw enough dirt, some of it would be sure to stick. Now, I should like first to ask what is the exact charge—no, not charge, but what is the exact statement that has been made—because the impression produced out of doors is very different indeed from the natural impression that would be conveyed to the mind by reading the evidence. The general impression out of doors undoubtedly is that I, as a member of this board, used my influence as a member to obtain the contract for the contractor, and that for the influence so exerted I received a sum of money. That is the general impression. The inference to be drawn from the evidence is this—I admit it is a very fair inference indeed from the reading of the evidence—that I produced two gentlemen as sureties for the contractor; that these gentlemen undertook the suretyship, and as sureties undertook the responsibility and risk of the bargain; and that a part of the money which they received I received for the introduction. I think I am acting fairly in stating that this is the fair inference to be drawn from the evidence which has been given, but it is in direct contradiction, I may say, to the impression out of doors. That is a very different thing; it is that certain influence was used, and that for that influence a certain sum of money was paid. Now, sir, to that statement, or, rather, to the inference which is fairly to be drawn from that statement, I have come here to-day to give a firm, an unbesitating, an unequivocal denial, and also to the inference, which I admitis a reasonable one—namely, that certain sums were paid to the sureties whom I produced for the bankrupt, and that a part of that sum I received as a member of this board. As evidence of the truth of that which I have stated, I sought, with some difficulty (it being four years ago since this transaction), to obtain some evidence to lay before the board in order to show the truth of that which I have stated. I have received a communication which is marked "Private," but with certain reservations I will read a sentence or two, and then place the letter where the writer wishes to place it. In sending me this communication I regret that it has been necessary to insert in it the names of other persons not connected with this board, but I may at once say that as it was sent to me as a private communication, I can only comply with the request, with this exception, that I shall certainly read enough to explain my position. It is from a gentleman who is thoroughly conversant with the whole matter from the beginning to the end, and the last paragraph runs thus: "I write this to you as a private communication, giving you liberty, however, to place it in the hands of your chairman, or any committee who may be appointed to investigate the matter." And in this letter, written, as I have said, by a gentleman who knows every particular connected with the transaction, he states distinctly, and in terms "that you did not receive anything in the shape of cash or bills for your own use or profit in reference to this matter." I very much regret it, and I do not see very much in it myself which would render it necessary to consider it a private document at all. I should be very glad, if it were not for that mark upon it, "Private and confidential," to read the whole of it to the board. I have endeavoured to obtain permission for the whole of that letter to be published, but I have not yet received that permission. I can only, therefore, comply with the writer's request, and place it in the hands of the chairman, who is at liberty to place it before any committee appointed thoroughly to investigate the matter. Now, sir, what I did was this—I introduced the contractor to these two gentlemen, and it arose in this way. I was in a building not far from this place, where I saw the contractor in conversation with a gentleman who had upon a previous occasion been his surety, and to my utter surprise he then told me he had paid for the recent contract which he had taken under this board no less a sum than £20,000. I told him I thought it was a foolish thing to do so, and a ridiculous thing to imagine that responsible sureties could not be got for less money than that. I then introduced him to one of these gentlemen, who undertook it for him at something like less than half what was paid for the previous contract; but out of that half so received not one penny ever came into my possession. Now let me just say here, that if ever there was an absurdity greater than another which could get into the brains of a man it is this—that any contract was ever obtained from this board by reason of any influence exercised by any member of it. I do not believe it possible. I am sure that the contractors know that also, and I am quite sure that no contractor with whom we have ever been connected has ever been mad enough to pay for such imaginary influence a sum such as that which it is said I received in this matter. Why, sir, the whole history of the board gives the lie to the statement. When we have had contractors tendering

for smaller matters, when we have had positions to give, and very many applicants for these positions, it is very true we have had before us one or two whom we have preferred to others, and whom we have preferred by reason of testimony placed before us, and for whom we have exercised legitimate influence in order that they might obtain the position desired; but that any undue influence was ever exercised in favour of any contractor, or of any person desiring a situation under this board, so far as my experience goes I emphatically and distinctly deny it. We have a legitimate influence here, and we have exercised it. When we have before us some six or seven candidates for any position, if we know not those candidates personally, we naturally bow to the opinion of those who have had some knowledge of their ability and trustworthiness. Beyond that I believe the members of the board have never gone. And it is very singular that on this very question, in which I am supposed to have been so deeply interested, although it was before the board and before committees (viz., the acceptance of this contract) on many occasions, on no occasion, either in committee or before the board, did I raise one word in favour of this contractor; and not only this, but when there was a division I did not record my vote. You may take that, indeed, for what it is worth; I merely name it as a matter of fact, which can be proved by reference to the minutes of the board. Sir, I regret that I should have to proceed any further. But for the debate of last Friday I should have been content to have stopped here, and have allowed you and a committee of the whole board to investigate this matter; and I should have been quite calm, and content to have received the reply of that committee, before whom may be placed not simply the documents I have placed on that table, but other evidence which I venture to think will be conclusive to every single member of this board. Probably you may question my discretion, but I venture to be assured that when you see the whole history of this case, from the beginning to the end, there is not one member of the board who will be prepared, in his place here or elsewhere, to endorse the opinion which indirectly was expressed here last Friday—viz., that the inference to be drawn from these statements is true. But when I, this morning, for the first time, saw the debate which took place last Friday, I felt it was not possible to leave off and stop here. Sir, this is not the first time that charges affecting my public character have been made here and elsewhere, the only basis or foundation for which being that not only with that contractor, but with other contractors—in fact, with most of the contractors in London—it has been my fortune to have connexions from time to time; and I say here, upon that fact alone, statements have been made utterly indefensible, and which I challenge any member of this board to prove. Four years ago this transaction took place. Two years ago, in connexion with this very same matter, an attempt was made by a fierce political opponent to justify the same charge against me that has now been made. He utterly and ignominiously failed. Two years having elapsed, the same charge in a different shape is made, the same person being at the head, supplemented by the aid of a personal, political, parochial opponent, who owes much of the reputation he possesses for honesty to the shelter which, in times past, I threw around him. This is the same charge—an off-shoot of the same charge—by the same man, with the addition I have named, as that previous charge which ignominiously and utterly failed; and so I tell this board, and so I tell those men, that they will utterly and humiliatingly fail on the present occasion to establish that which they attempt. Sir, it will be said that you, as a board, have not made any charges—that you, as a board, have merely stated facts, as recorded in this document. But what I complain of is this, that when you had before you the simple question (I am not now going to speak of the whole of the members of the board—there are two or three to whom I shall allude)—that when you had before you the question simply whether this matter should be discussed by a committee of the whole board, or before the board itself in public, you availed yourselves—some of you—of that opportunity, by implication, of asserting the truth of the statements contained in—or rather the truth of the inferences drawn from—that document. That is my complaint against the members of this board. And I ask why this gratuitous anxiety to discuss the question before I had the opportunity of offering my explanation? The honour, the dignity, the character of the board, is a very serious question. If ever there was a report that rather amused me than otherwise, it was a report which I read this morning in one or two of the papers as to the proceedings of the board on Friday. Of course, when the honour and dignity of the board are at stake, we naturally look to the men who uphold the dignity of the board to protect its honour. Naturally enough, this fell to the lot of my friend on my right (Mr. Richardson). He led the question, I see by the report of the debate, and was particularly emphatic. But, although he was wise enough not to reiterate the charges which had been made, or in words to approve of those charges, he took very good care repeatedly, by implication, first to assert his own virtue and purity, and next to throw his shelter around the dignity and character of the board. When, sir, I read those repeated, those reiterated, those gratuitous statements of the honourable gentleman, I could not help feeling as I should feel if one of the opposite sex was found proclaiming her virtue at every corner of the street. I should merely say, "I don't believe it." Then after the honourable gentleman had spoken, a gentleman rose (I have not got the report now before me) who has a peculiar knack of putting in the smallest number of words the most objectionable things, and who, when he has uttered the objectionable things, is in the habit of repeating them over and over again. That was my honourable friend Mr. Savage opposite. What he said was little. He said: "It is exceedingly awkward;" and I can imagine the way in which he said "It is exceedingly awkward," and what the inference was to be derived from that little phrase. What was the inference? Why, that the honourable gentleman firmly believe I was not willing to appear in my place here to meet the charges made against me. Then he was followed by another gentleman who was still more emphatic. He comes from an emphatic neighbourhood, and he said, I think in these words (he delivered himself with very great solemnity), that "they had before them a gentleman who was supposed by virtue of his talents to have risen to a high position." I am much obliged to him for the compliment, but I am afraid I shall not be able to return it. "A gentleman who was supposed by virtue of his talents to have risen to a high position, but who had obtained it by purchase." Well, that was rather a broad statement, without any explanation being afforded or given, and I venture to think it was one of the most ungenerous, one of the most unmanly statements that was ever made by one colleague against another. And where did that come from? Where could it come from? Why, sir, this statement—this species of parochial Fenianism—this stab behind the back—could only come from the parish of Marylebone. Well, sir, in matters of virtue, in matters of character, in matters affecting the dignity of the board, it was very natural that the debate, which commenced with the honourable member for Greenwich throwing his sheltering wing over the dignity of the board, should be wound up by the honourable member for Paddington doing the same. The honourable member for Paddington demands publicity; the honourable member for Paddington has appealed to Cæsar—to Cæsar he shall go. For, sir, in looking at the whole of this question—not forgetting the other questions which have arisen in reference to the matter, and matters kindred to this, and within the last few days having received a communication containing fresh charges against myself in relation to the transactions of the board—I wrote a letter to the contractor himself, of which I will read a copy. It is dated on Tuesday week:—

Dear Sir,—I have only this morning read the evidence given by you before one of the registrars in the Court of Bankruptcy. May I ask you upon what ground you assume that I was partner with the two gentlemen who were your sureties for the Thames Embankment contract, and with them shared the amount paid by you for such suretyship? It is also asserted that I was interested with you as a partner in the use of a particular granite for these works. I am aware that this is not in your evidence, but, as it is distinctly stated that you are the author of the statement, I shall be glad to hear from you as to whether or not there is any foundation for the assertion.

This latter is an old charge made against me, but when I was clearing up one I thought I might as well clear up the other. The answer I received is the following:—

Dear Sir,—In reply to your letter of the 12th inst., I beg to say that, if you will refer to my evidence, you will see that I do not state with any certainty as to the amount received by each. I certainly assumed that you were a partner with the sureties—first, from the fact of the sureties being introduced by you to me; and, secondly, from the fact of some bills that they had bearing your signature and endorsement, and, upon my requiring the sureties to renew some of the bills, they refused to renew unless you endorsed the renewals. Not knowing how the sum which I paid for the suretyship was dealt with, I naturally concluded you had an interest in the transaction. The statement as to the granite is without any foundation. The only way in which you were connected with this matter is as follows:—On the morning the contract was to be let, Mr. Roche, the member for Paddington, met me at the office in Spring Gardens, and asked me into one of the court-rooms, where he promised to support me for the contract if I would enter into an agreement to have the granite from the Lundy Granite Company. This I agreed to do provided the granite was approved by the engineer, and he then and there wrote out a contract, which he wished me to sign. This I did, and by it I undertook to have all the granite from the Lundy quarries, in which I believe he was interested; and, upon my suggesting the necessity for some referee being named in case of any dispute, your name was inserted by Mr. Roche, but without your knowledge it appeared, as he afterwards, when you entered the room, showed you what he had done, and produced the agreement. As you know, the granite from the Lundy quarries was never used, and to this fact I attribute the unceasing persecution of me by Mr. Roche, and which more than anything else led to the difficulties in which I am placed. I think I should state the reason for my signing the contract for the granite was Mr. Roche's telling me that Ridley had signed a similar one previously, and he produced one to me bearing Ridley's signature.

(Signed) GEORGE FURNESS.

This is from the guardian angel of the honour and credit of the board! Why, sir, for breadth of view, none but a lawyer could have thought of such a thing. Granted that I was interested in Mr. Furness having the contract. I was very anxious he should have it, for I have been associated with him in other ways, and I was desirous, other things being equal, that he should have the contract, and that, if possible, the granite out of this very quarry should be used. But imagine the foresight of the honourable member. He was not content with the guarantee of Mr. Furness, but he throws his net far and wide, so that, whatever might turn up, he, at least, would be sure to be safe. I never contemplated a state of things so broad and so sure to be successful as that to which I have just referred. There is one other point which I am desirous to state. You have got the evidence before you, and you evidently attach great value to it; but at this moment, as you have heard from the letter read this morning, this evidence has never been seen or corrected by the person who gave it, which is very customary, I believe. He was taken there to give evidence without knowing upon what point he was going to be examined; his evidence was given in his rough-and-ready style, and there you have it; and, by the simple statement made by the chairman, it is clear it is incorrect in more than one instance. But will the board believe what I am about to state? I find it difficult to believe it myself, but will the board believe that this is not the whole of the evidence given? Will the board believe that after Mr. Furness gave this evidence, he being in the humour to make a full and clean sweep of all he know about the board and other people—will you believe that after the last answer he went on to give evidence about this very granite question? Will you believe that he went so far as to mention, more than once, Mr. Roche's name? Will you believe that he was stopped short, and told that this was not relevant to the inquiry—that it was not the business of the day they had met to inquire into? Clearly it was foreign to the business: the purpose was gained, and all the evidence was given that was desired, and it was not likely that counsel, instructed I will not say by whom, would allow any evidence so utterly beside the question to be given as that relating to another member of the board, though pertinent as relating to one; or would permit any other question relating to the board except the one question in which I was concerned. I confess when I was told that I did not believe it; but instantly I did hear it I went down without a moment's hesitation, and asked Mr. Furness this simple question—"Is this the whole evidence you gave?" "It is not." "Did you allude to any other matter connected with the board?" "I did." "Did you allude to any other member of the board?" "I did." "Who?" "Mr. Roche." "Why is it not here?" "I do not know. I was cut short by the statement of counsel, that they could not inquire into that matter." Now, sir, no one more regrets than I do the use of personalities; but there are times when the interests of fair play and common honesty demand that we shall depart from general statements, and say, as I do now, "Thou art the man." I say again that the inference to be drawn from the evidence I distinctly and emphatically deny. I place in your hands, and in the hands of the board, some evidence, and I am prepared to produce more, to show that the statements which have been made are without a shadow of foundation.

Mr. H. L. TAYLOR said he did not know what course the board would take in the matter, but he was sure he expressed the sentiments and feelings of all the members when he said that they were very glad to have seen their colleague present for the purpose of offering the explanation he had done. He only regretted, as he stated at the last meeting, that Mr. Doulton was not able to be present on that occasion, and make the application personally which he then made through the chairman, that this matter should be referred to a committee of the whole board, to enter on the consideration of these charges. The honourable member stated that he was prepared to offer additional information to the committee which he was not justified in giving publicly; and certainly a communication marked "private" could not properly be laid before the present meeting. Mr. Doulton also said that he could give additional evidence to prove what he had alleged—viz., that the charges made against him were unjust. Under these circumstances, it was the bounden duty of the board to accord so much to their colleague that there should be an opportunity afforded him of giving those explanations, so that his character as a public man might be unsullied. And although Mr. Doulton did not himself now ask for a committee,

yet, after the statement he had made, it was the duty of the board to refer the matter for further investigation.

The CHAIRMAN said he would suggest that while the explanation was fresh in the memory of every member and Mr. Doulton was present, it might save some inconvenience if, after the public discussion, the board could once resolve itself into a committee on the subject.

Mr. DOULTON said he should like to place other evidence before the committee, but he was not prepared with it at the moment.

Mr. TAYLOR said he had previously gathered from the honourable member that he was not prepared with his additional evidence, but would give it on a future day. He therefore moved that the question should go to a committee, with instructions to report fully thereon.

Mr. FREEMAN seconded the motion.

Mr. SHAW thought the public would have reason to rejoice in the bankruptcy of Mr. Furness, as it had furnished the opportunity of exposing the system practised at this board in taking contracts. He wished it to be understood that the reference he made on the last occasion to a man who was said to have raised himself to a position by purchase was not applied to Mr. Doulton, but to another member of the House of Commons. Looking at the irregularity in commercial matters in boards and railways at the present time, the name of British merchant had become degraded in the eyes of France and every other country of Europe, and it was time these things should be exposed. He repeated now what he had said before, that Mr. Doulton was accused on oath of having taken a sum of money—a bribe, in fact—for his influence at this board, and that he had the remedy in his own hands. If the honourable member had been libelled, he had the power to bring an action against the person who libelled him for defamation of character. He would have the board go further and inquire how these sureties were taken. Mr. Furness tendered for £500,000, and he admitted that on a former occasion his sureties cost him £20,000. He stated also that he expected to make £100,000 out of this contract, and that he could afford to pay 30 per cent. upon the profits for financing it. It was a very important question for the ratepayers of the metropolis to know how it was that a contract with so many advantages should be granted, and at the same time that the estimates for this work were so greatly increased. There was an increase in the estimates for the northern embankment to the extent of several hundred thousand pounds, so that a very much larger sum than the work ought to have cost was put upon the ratepayers for this contract. Mr. Furness stated that the two sureties were to be obtained for him by Mr. Doulton, and that he never saw those sureties until he saw them at the board. How were those sureties introduced to the board? That was a question which materially interested the ratepayers. When Mr. Ridley was told that his sureties were not approved, he proposed to lodge the amount of money required at the bankers of the board. But this was refused, and two men were taken whose security turned out to be worth what? The contractor was bankrupt, and where were the sureties? (Question.) He thought it was the question; but he did not see that they had any power to go into any question as to Mr. Doulton. The circumstances, however, would give the public an opportunity of seeing how the board transacted business, and in what way their contracts were taken.

Mr. RICHARDSON said, as he took a prominent part in this matter on the last occasion, he should like to make a few remarks, especially as the honourable member for Lambeth had referred to him in rather a sarcastic manner, although he had not been able to attack his character. He was still of opinion that the question should be investigated by the whole board in public. He regretted that the honourable member should have been so mixed up with and have allowed his name to appear on bills for a contractor of the board. What Mr. Doulton had stated was nothing more than a simple denial of the charges, and of course it must be taken for what it is worth. The public would take it for what it is worth, and it must not be supposed that they would be satisfied. Mr. Doulton had not referred to the worst part of the charges, on the last page but one, but it might be presumed he denied them as well as the others.

The CHAIRMAN said the course pursued by the board from the commencement was to advertise for tenders. These were opened in the presence of the whole board, and were determined by them, so that no individual member, or half a dozen members, could secure a contract to A. or B. by any individual personal influence. Under this system of tendering, the board necessarily required sureties for the proper performance of the contract, and a system had grown up of late of contractors giving money consideration to persons who became security for them. It would be a question for the consideration of this board whether that system of having securities was to continue or not. It was a question which some members had already seriously debated, because ultimately this money must come out of the pockets of the ratepayers.

Mr. ROCHE: The honourable member for Lambeth, Mr. Doulton, has thought proper to say that, as I, on the last occasion that I spoke here, expressed a desire for publicity, he would take care, so far as I understood him, there should be publicity to the full. And it certainly appears, so far as any one can form an opinion, that after that occasion communications took place between the member for Lambeth and Mr. Furness, and a certain letter was written by Mr. Furness, which I suppose was duly considered and weighed by certain parties before it was sent. That letter is dated the 13th. I think it must be quite clear that the course which the honourable gentleman has taken has been to throw as much dirt as he could at every member of the board, commencing with his colleague (Mr. R. Taylor). Mr. Doulton endeavoured to insinuate something against every member who has sufficient independence to stand up in his place and ask for a public investigation and inquiry. I must say that I think when his speech comes to be considered hereafter, the honourable gentleman will stand very low indeed in the estimation of those who read it. Now I do not quite understand the denials of Mr. Doulton. I understand him to emphatically deny that there is any foundation whatever for the statements made by Mr. Furness upon oath, that he was in any way interested or in any way participated in that sum of £9000, or that Mr. Furness gave to Mr. Doulton accommodation bills. I understand the statement to be, that that which Mr. Furness has sworn to on oath, Mr. Doulton declares to be without foundation. I think that is so. I said on the last occasion that if he came here and denied those statements, he would be addressing a body of gentlemen, and his statement would be received. I understand him now to make such a statement, but it seems a letter has been received from somebody—from whom it is not stated—and there is to be a private committee, before whom the statement is to be made. He has made an extraordinary assertion that this was not the only evidence given. We must apply to the solicitor of the board on that point, and see whether this is a perfect document which we have before us. Mr. Doulton has thrown out some insinuations, but, so far as I am concerned, I knew nothing of this evidence at all until it was communicated to me by a member of the board. Then he says that there is other evidence—that this is not all. Now, I ask that every word that Mr. Furness stated should be brought before the board and before the public.

The CHAIRMAN: I am sure the solicitor will bear me out that this print is a fair copy of the lithographed evidence supplied by order of the commissioner. The evidence which Mr. Doulton referred to is evidence given by Mr. Furness, and struck out at the time; therefore, it formed no part of the document supplied to our solicitor.

Mr. ROCHE: The solicitor had better refer to the original document itself, and examine this with it, and see whether this is all the evidence that was given.

The CHAIRMAN: It has been examined, and it is a copy of the evidence.

Mr. ROCHE: Then, so far as that goes, I ask that you get a copy of everything that was struck out. If it was even struck out because it was irrelevant, let us have it. So far as we are concerned, let everything be brought forward. I confess I was very much amused at the course which Mr. Doulton has taken. He has thought proper to write to Mr. Furness, and has got a letter from Mr. Furness, which perhaps I cannot do better than read, and reply to paragraph by paragraph. Mr. Furness says: "On the morning the contract was to be let, Mr. Roche, the member for Paddington, met me at the office in Spring Gardens, and asked me into one of the court-rooms, where he promised to support me in the contract if I would enter into an agreement to have the granite from the Lundy Granite Company." Now, I say most distinctly and unreservedly I never made any such promise to Mr. Furness, or to any other party, and the best evidence of that will be that when the tenders were taken I voted for Mr. Ridley, because his was the lowest. I see a statement is made at the end of this letter to this effect: "I think I should state the reason for my signing the contract for the granite was that Mr. Roche told me that Ridley had signed a similar one previously." Now, I am speaking entirely from recollection, but I have no knowledge at the present moment, and I will refer back and inquire into it, that there was any contract with Mr. Ridley at that time, that I ever produced it or ever saw it. My own impression is that there never was such a contract, or that, if there was, it was never produced. Now, let me state how far I was connected with Furness, or Ridley, or any one else. In my professional capacity I was instructed to draw up a contract for the supply of granite, and I was exceedingly careful as to the course I took. I was not acting for the contractor, and I received no remuneration from the contractor in the shape of accommodation or any other bills, nor did I ever receive one single sixpence in any way. I had a simple duty to perform to the company for whom I was professionally engaged to prepare the contract; and I was exceedingly careful what I said, for I could see pretty well what this might lead to. I am not sure whether the honourable gentleman himself (Mr. Doulton) was not the party who negotiated the contract between the company and Mr. Furness. I was careful that the whole of the negotiations should be carried on by the parties themselves, who were interested in the company. With respect to those negotiations I took no part whatever. I simply prepared the legal document, and got that legal document signed. With reference to the name of Mr. Doulton, I am perfectly certain that it was inserted at Mr. Furness's own request, because he said Mr. Doulton was his great and sincere friend, and one in whom he placed the most implicit confidence. What I did was in my professional capacity; I had nothing to do with Mr. Furness, and I think, as the honourable member has thought proper to call my name in question, he must allow me to tell him that I have been invited to act for contractors and their sureties with this board, and I have refused to do it—on one occasion especially, although the gentleman was my own client who became surety to the board, and had to pay a large sum of money in consequence. In one part of the letter Mr. Furness says: "Your name was inserted by Mr. Roche"—no doubt it was, and at the special request of Mr. Furness—"but without your knowledge, it appears, for he afterwards, when you entered the room, showed you what he had done, and produced to you the agreement." That might be so, if the honourable gentleman entered the room; but I am quite sure he approved of it, and accepted the position of being referee for Mr. Furness, or it would have been altered immediately. I am not sure, but, as far as my recollection goes, the honourable gentleman himself made the appointment here. But allow me to say, with reference to the Lundy Granite Company, I have no interest in it—never held a share in it—only acted professionally in preparing documents, and have long since ceased to have any connexion with it. I was always most careful that my influence here should never be made use of by the Lundy Granite Company for the furtherance of their purposes, and I voted for Mr. Ridley because his was the lowest tender. Mr. Furness's letter proceeds: "As you know, the granite from the Lundy quarries was never used, and to this fact I attribute the unceasing persecution of Mr. Roche which more than anything else led to the difficulties in which I am placed." I am sure any gentleman who has read through that document, and who has seen Mr. Furness's position—who has seen that at the very time he took the contract he was little better than insolvent—who has seen the whole of his transactions as stated by himself, and his endeavours to raise money—must be astonished at the audacity with which he can now come here and say that any gentleman's public conduct at this board has been the cause of his being there. One cannot help seeing that this letter has been written—written for a purpose—written with the sanction, and, for aught I know, at the dictation, of the gentleman who produces it. I should not be surprised if it was, for, from what I have seen, I think he is capable of doing it. But be that as it may, it is written for a purpose. It is an endeavour on his part to throw the dirt off himself on to some one else—to get some one to be the scapegoat, that he may come clean out of the transaction. I cannot look upon it in any other way, and whether it be so or not, it certainly has rather the appearance of it. I deny the fact that I had any interest in it, or that I ever promised Mr. Furness a vote on any occasion. I was very careful never to see him, and I believe the only time I did so was when he had to sign and I had to witness the deed in the usual way; therefore I should like this matter to continue public, and I think I have some right to ask it. We are told there are certain other names in the letter which cannot be produced before the board. Why not? Whose names are they? Why is this to go into a secret committee? Why not let the whole matter be made public? If that gentleman who wrote the letter cannot come before the public, let us know the reason. The letter is marked "Private and confidential." Very good. Let it be sent back to the writer, and tell him we cannot receive any private communications, and let him write such a letter as we can make use of. I cannot help seeing that there is an endeavour to get this referred to a committee, and I think I have a right to ask that, for the future, these imputations, which I have no doubt the honourable member has instigated, be made publicly. I will look back for the documents, which will show that the part I took in this matter was strictly professional, and that it never for one moment influenced my conduct at this board, or that it can ever be said with truth that I was a party to assist a contractor to get a contract and received remuneration for so doing.

Mr. THOMPSON, as one of the members who on the last occasion stated his opinion that this inquiry should be publicly made, desired to repeat that statement in the presence of Mr. Doulton. His reason for that opinion was that the case of a member was very different from that of an officer of the board. The board was responsible for the actions of its officers, but each member of the board was responsible to the public. He was glad to have heard the manly statement of the honourable member, and he hoped the sequel would prove that he was correct in the utter denial he gave to the statements placed before them, for he was sure nothing would gratify the majority of the members of the board more than that, although he could not help saying that the honourable member had endeavoured to bespatter his colleagues because they had endeavoured to do their duty in this matter. He would have been more pleased if the honourable member had referred to the evidence on page 36, because that appeared to be more important than the accusations levelled against him in the earlier pages. He could not believe that it was within the compass of any member of the board to have dealings with their contractors, and therefore he thought some additional evidence should be given to enable the other honourable member to clear himself. He was not able to see but what the last-named gentleman ought not to have declined to act even professionally in the matter, or to earn a sixpence in connexion with any transactions which came before the board. The matter could not rest where it was, and it must be investigated, so that if the board declined to take the inquiry publicly, he should vote for its going to the committee.

Mr. FREEMAN said the real question was, how could this matter be investigated most fully and most thoroughly. He thought they might trust themselves to investigate it in committee. It would not be a secret committee, but a committee of the whole board. The gravest charges were those on page 36. Could they in open court go into charges affecting the character of private individuals? Then, as Mr. Furness had said things in which the chairman said there was not a tittle of truth, and as Mr. Roche said he had written a letter to Mr. Doulton on purpose to ruin him, could they put a hundred and one questions to Mr. Furness in open board so well as in committee? He had no objection to go on in open board, but he thought there could be a fuller investigation of the matter in private. If the board was to exist and command the confidence of the public, no such statements could be thrown from left to right and from right to left without being thoroughly sifted.

Mr. HEALEY, as the seconder of a proposition made by Mr. Richardson on the last occasion, that this inquiry should be in public, still maintained the same opinion, believing that any other course would not be satisfactory.

Mr. TURNER reminded the board they had no power of compelling witnesses to come forward, and there were those who would come before a committee who might refuse to come before the board. Mr. Furness had stated that he paid Mr. Doulton himself, partly in money and partly in bills, and that these were entered in his own bill-book. That was beyond the range of inference. If he had said that he paid money to the sureties, who handed a portion of it to Mr Doulton, that would be only an inference; but, when his statement was that he actually paid money and bills himself to Mr. Doulton, that statement could not be met in such a way.

Mr. PHILLIPS thought a public investigation was absolutely necessary from what had taken place. The inuendoes reflected upon other members than Mr. Doulton. The honourable member for Lambeth must have been gratified in being able to make his statement to-day, and he (Mr. Phillips) agreed with Mr. Thompson that it was a manly statement, and it was one which he hoped would be substantiated in a very positive way. He was inclined, however, to think the matter must go to a committee for elucidation, as probably persons whom Mr. Doulton would be anxious to bring forward would not appear at the board in public. He was not quite satisfied with the letter Mr. Doulton had referred to as "private," and he thought the honourable member should either have got permission to read the whole of it, or should have abstained from referring to it at all.

Mr. HOWS, as an old member of the board, expressed his earnest desire for a full and searching investigation, and thought that the inquiry which had commenced in public should be continued and concluded in public.

Mr. HALL said if, by sending it to a committee, there would be any chance of secrecy, he should oppose the motion. He was for a thorough investigation, and believed it would be a grave error to keep anything from the public.

Mr. EVANS supported the motion, believing that only before a committee could the whole of the facts be ascertained. There would be no secrecy about such an inquiry, because the committee would report to the board, and a more satisfactory discussion of the whole question could then take place.

Mr. DOULTON said the question at issue was one upon which he did not desire to express an opinion. All he could say was, that he neither approved nor disapproved of the suggestion. If the board determined to proceed with the inquiry in committee, he would produce the evidence he had referred to. If they desired it to be in public, he would endeavour to make that document and other matters public.

Mr. SAVAGE was in favour of a public inquiry, but he could not help feeling that the board had no power to compel persons to come forward; and, as it appeared that the names of persons not connected with the board were mixed up with these transactions, he was induced to support the reference to the committee.

Mr. NICHOLAY said they had the evidence of Mr. Furness on oath that he paid this money to Mr. Doulton, and that his statement would be verified by his books. If Mr. Doulton denied that he received any money, and that the entries in Mr. Furness's books were false, then let Mr. Furness go to the wall.

The CHAIRMAN: I think, from what I know of the board, I may say this is the last body in the world to allow the matter to sleep without a full investigation. The question is, can you get the same evidence in public as in private? If you can, then by all means have it in public; but if you cannot get the same evidence in public, then, as men of business, desirous of getting all the evidence you can, you ought to have it in private.

Mr. TAYLOR having replied, the motion to refer the subject to a committee of the whole board was put, and agreed to by a considerable majority.

Mr. ROCHE moved that the proceedings of the committee should be open to the public.

Mr. HOWS seconded the motion.

Mr. FREEMAN and Mr. ELT opposed the motion, which was supported by Mr. RICHARDSON and Mr. SHAW, the latter remarking that, if they determined upon a sort of Pan-Anglican meeting, it would be very unsatisfactory to the public.

The motion, on a show of hands, was lost, and upon a division there appeared for the motion, 13; against it, 18; majority against it, 5.

It was resolved that a shorthand writer should be engaged to take notes of the proceedings of the committee, and the board then adjourned.

METROPOLIS GAS SUPPLY.

METROPOLITAN BOARD OF WORKS—FRIDAY, NOV. 22.

At the Meeting of the Board this day—Sir JOHN THWAITES in the chair,

The SOLICITOR (Mr. Smith) reported that notices had been given by the Imperial Gas Company of their intention to apply to Parliament for additional powers next session; by the Chartered Gas Company, for a bill to enable them to dissolve and reincorporate the company, to purchase lands at Barking and West Ham, construct new works, and levy rates, &c.; and by Messrs. Baxter and Co., for a bill to amalgamate all or some of the metroplitan gas companies, to regulate capital, alter districts, and amend Acts. He also reported that notice had been given for a bill to alter or repeal the Act of 1860, for better regulating the supply of gas to the metropolis, and the local Acts; to regulate the quality and illuminating power, the mode of testing the supply; to enable this board and the City to purchase works; to compel the companies to sell gas in bulk at a price to be settled by arbitration, and to enable the board to supply gas to public and private consumers. He recommended that the whole of these bills should be referred to the special Gas Committee.

The CHAIRMAN: With regard to the Metropolis Gas Bill, that is a matter in which I need hardly say this board has taken a very deep interest. The subject was discussed here a short time ago, and you arrived at the conclusion that it was not expedient to proceed to Parliament with any bill next session. Most of the members have no doubt seen a public notice that it is the intention of somebody or other to apply to Parliament for powers which are set out very minutely in that notice. The subject was brought before the Works Committee the other day, and I was requested to see the Duke of Richmond, the President of the Board of Trade, and ascertain from him whether this notice had emanated from that department of the Government, or whether it was a notice given by other parties. I had the opportunity of obtaining the information yesterday, and I find that the Board of Trade are no parties whatever to the notice which has appeared in the public papers signed by Mr. Wyatt, the parliamentary agent. I also ascertained that a deputation, consisting of Mr. Beals and some other persons, waited upon the President of the Board of Trade, and urged upon his consideration the desirableness of the Government giving notice for the introduction of a bill, in the coming session, to deal with the metropolis gas companies. The Board of Trade, however, declined to accede to that request. They were then asked to give the notice, even if they did not intend to proceed with such a bill. The Duke of Richmond very properly objected to his department of the Government giving notice for a bill which they had no intention to introduce. He stated to the deputation that they might themselves give notice of a bill, and Parliament would then deal with the question as it might be thought necessary; but that, so far as the Board of Trade were concerned, they would take no steps in the matter, and that they had not authorized the publication of the notice which has appeared in the newspapers. I state these facts that the board may know exactly how the matter stands.

Mr. NEWTON: This is a very important question for the board, because these same gentlemen, seven years ago, adopted a similar course, the result being that we were saddled with parliamentary expenses to the extent of £5000 or £6000, which of course had to come out of the pockets of the ratepayers. I think, therefore, we must be very careful to watch their proceedings, so as to see that the ratepayers are not again saddled with heavy costs, incurred in a futile attempt to amend the supply of gas to the metropolis. I say a futile attempt, because clearly by the proceedings of these persons they placed the consumers of gas in a worse position than they were before the passing of the Act of 1860, and involved us not only in the cost of passing the bill—for they got a clause inserted by which all their expenses were thrown upon the board—but involved us and the corporation of London in the subsequent expenditure of many thousands of pounds in trying to upset that very bill I think we must watch the proceedings of these persons very closely, in order to see that whatever costs are incurred under this notice do not fall upon the board. I will move that it be referred to the committee for that purpose.

Mr. TURNER: I second the motion. There is one thing I want to understand. On the face of the *agenda* paper to-day, it appears as if the notice for this bill had been given by the Board of Trade. From the chairman's statement, however, it seems that the Government have nothing to do with it, but that some persons have given the notice in the name of the Board of Trade without authority.

Mr. SMITH: The statement on the *agenda* was made under a misapprehension. You will recollect that last year the agent who conducted the bill for the Government was Mr. Wyatt, and his name now appearing to the notice, it was supposed he was acting for the Government in the matter. We are mistaken so far.

The motion was then put and carried *nem. con.*

ALARMING FIRE AT THE SOUTH SHIELDS GAS-WORKS.—About one o'clock in the afternoon of Friday last, a fire that was fraught with considerable danger broke out in the engine-room of the South Shields Gas-Works. A small governor is fixed in the engine-room as an exhauster governor, one of the guides of which broke, and the effect was to cause the governor to tilt so as to allow a column of gas to escape. The escaping gas ascended until it came in contact with a lighted jet near the clock at the top of the engine-room. Immediately the engine-room was one mass of fire, and the workmen became so extremely alarmed that they ran from the premises, but fortunately Mr. Warner, the assiduous manager, was on the premises, and with great presence of mind, rushed into the room and turned the gas off from the governor into the pipe provided for cases of emergency, and at once the destructive column of burning gas was extinguished. Ere this could be done, however, the roof of the engine-house was slightly burnt, and the governor, which was of slight material, was destroyed. A little water soon extinguished the fire in the roof, and beyond the damage named, which will not amount to more than £20, the fire was attended with no other injuries.

OCCURRENCE OF SULPHOCYANIDE OF AMMONIUM IN GAS-MAINS.—Dr. Letheby, in a letter to the *Chemical News*, says:—"The existence of sulphocyanide of ammonium in gas-mains, even at considerable distances from the gas-works, is of very constant occurrence; and it is not carried by the gas, as Mr. Hart suggests in his paper before the Manchester Philosophical Society, but is produced in the mains and service apparatus by the action of the ammonia on the bisulphide of carbon contained in coal gas, thus:— $2\,NH_3 + CS_2 = NH_4\,CNS + H_2S$. This may at any time be proved by passing the purified gas supplied to the public through hydrate of lime, and soon, if ammonia be present, the lime will be found to be charged with more or less of sulphocyanide of calcium. This reaction will account not only for the presence of sulphocyanide of ammonium in the water of all the hydrants and water-meters of a district, but also for the ferrocyanide and sulphide of iron which are so commonly found in the iron mains."

CHERTSEY GAS CONSUMERS COMPANY, LIMITED.

The Annual Meeting of the Shareholders of this Company was held on Thursday, the 17th ult.—Mr. J. MADOCKS in the chair.

The SECRETARY (Mr. Whiting) read the following report (the statement of accounts, which had been previously circulated among the shareholders, being taken as read):—

The directors, in presenting their fifth annual report, have again to congratulate the shareholders on an increased revenue.

The annexed account shows a net profit of £399 5s. 2d. for the year, and the directors having considered it desirable to reduce the loan account, have paid off £100 from that amount, leaving £299 5s. 2d., and the balance of last year's account, £49 6s. 10d., amounting together to £348 12s., at the disposal of the shareholders. The directors recommend a dividend at the rate of £6 per cent. per annum, leaving the sum of £24 12s. to be carried to the credit of next year's account. In consequence, however, of a portion of the working capital being still unavailable by the stoppage of the English Joint-Stock Bank, and the large stock of coals on hand which are paid for, the directors suggest that the payment of the dividend should be deferred till January next.

In consequence of his removal from Chertsey, Mr. Biddlecombe resigned his seat in the directorship in September last, and the vacancy remains to be filled up.

Messrs. Madocks, Moir, and Bromley retire by rotation, and, being eligible, offer themselves for re-election.

Dr. *Capital and Loan Account, for the Year ending September 30, 1867.* *Cr.*

To Amount of capital called up, as under—				By Expenditure on works and parliamentary expenses		£5,640 18 2
600 original shares, at £5	£3,000	0 0		Balance of loss on purchase and sale of old works		32 18 2
600 new A ditto, at £1 10s.	900	0 0		Balance		327 13 8
600 new B ditto, at £2 10s.	1,500	0 0				
Cash received from shares forfeited	1	10 0				
			£5,401 10 0			
Cash on loan	£500	0 0				
Ditto from revenue account applied in reduction of loan	100	0 0				
			600 0 0			
			£6,001 10 0			£6,001 10 0

Dr. *Revenue Account* *Cr.*

To Balance from last year's account			£311 16 10	By Dividend of 5 per cent., declared at annual meeting, Oct. 25, 1866		£362 10 0
Accounts for gas sold—				Cash in reduction of loan		100 0 0
Quarter ending Dec. 31, 1866	£382 8 8			Cash paid for interest on loan and unclaimed dividend	£10 2 0	
Ditto March 31, 1867	360 19 11			Coals and cartage	591 19 11	
Ditto June 30, 1867	156 8 9			Salaries and wages	194 4 0	
Ditto Sept. 30, 1867	176 2 11			Lime	34 9 0	
Public lamps	115 8 1			Rates, taxes, and insurance	21 6 3	
Private ditto	6 12 0			Printing and stationery	16 8 3	
		1,198 0 4		New retorts and fittings	87 15 6	
Coke, lime, and tar sold		251 12 10		Repairs of works and tools	35 16 5	
Rent of ground		2 0 0		Rent of roadway	0 15 0	
				Auditor	2 2 0	
				Collecting voluntary rate	5 15 6	
				Bad debts and abatements	2 6 10	
				Accounts owing	49 7 4	
						1,052 8 0
				Balance		348 12 0
		£1,763 10 0				£1,763 10 0

The CHAIRMAN briefly congratulated the shareholders upon the position and prospects of the company. He thought to have seen a greater number present, but he believed the majority were well satisfied with the accounts submitted to them. He should be happy to answer any questions relative to the company's affairs, and afterwards to move the adoption of the report.

A short discussion took place as to the proposal of the directors to defer payment of the dividend until January next.

The CHAIRMAN stated that this was necessary, in consequence of their having no money available to pay it previously, the balances of the capital and revenue accounts having been laid out in coals, which would effect a great saving to the company. The only way in which an immediate payment could be made was by a loan, and it was a question whether that course was desirable

Mr. R. MOIR thought, as a matter of business, that the dividends should be paid at the end of the financial year, without causing the shareholders to wait another three months. The general feeling, however, seemed to be in favour of the directors proposal; and no other proposition being made,

The CHAIRMAN moved the adoption of the report, which was seconded by Mr. J. MOIR, and carried unanimously.

A vacancy in the direction, caused by Mr. Biddlecombe having removed from the town, was filled up by the appointment of Mr. H. Lovett, and the retiring directors, Messrs. Madocks, J. Moir, and Bromley, were unanimously re-elected.

Mr. MADOCKS returned thanks for his re-election, saying his best efforts had been used for the interests of the company.

Mr. J. MOIR also thanked the meeting on behalf of himself and Mr. Bromley. They had worked together for the good of the company, and hoped it would continue so.

The election of an auditor was then proceeded with, and Captain Dyer, who had officiated for the past year, was duly proposed and elected.

A cordial vote of thanks to the directors, for their services during the past year, was moved and carried, and the CHAIRMAN returned thanks. In doing so, he stated that to the energy of their manager (Mr. Hamilton) and secretary the company were greatly indebted.

The meeting then terminated.

CARBOLIC OR PHENIC ACID AND ITS PROPERTIES.

[*Lecture by Dr. F. CRACE CALVERT F.R.S., &c., before the Society for the Encouragement of National Industry in France.*]

Gentlemen,—I have readily accepted the friendly invitation of your illustrious president, M. Dumas, to submit to your notice some facts relative to carbolic acid. But before doing so, allow me to express publicly the feelings of gratitude which I owe to France for having opened to me the way to the profession which I pursue with such pleasure. In truth, it is to the sympathy of scientific men of this country, to the friendly assistance of one of your scientific celebrities, M. Chevreul, and to the liberality of your institutions, that I owe the knowledge I have acquired, the elements of which I gained at the Gobelins and at the Museum of Natural History, during the stay I made there. After these remarks I will proceed with the subject of my lecture.

No doubt most persons present are aware that when coals are submitted to the action of a dull red heat, in a retort, products are obtained which may be grouped into four classes.

1. Gaseous products, commonly called coal gas, and which are now employed in so general a manner as means of illumination, sources of heat, and motive power.

2. Water, containing ammonia and ammoniacal salts, substances which chemistry purifies, modifies, and which are then utilized in agriculture, manufactures, and medicine.

3. There distils with the above products a black, sticky substance, of an unpleasant odour, called tar.

4. There remains in the retort a solid, porous body, which is known to us all as coke.

When the above-mentioned product called tar is submitted to distillation, water first comes over, then there distil jointly with this fluid liquid carburetted hydrogens, which being lighter, float on it, and are therefore called light oils of tar; and, lastly, compounds heavier than water are collected, which bear the name of heavy oils.

It is these heavy oils which were the first tar products utilized in manufacture. Their consumption made such rapid progress in England, that special manufactories were established for their preparation, and these works were, for a long period, the only ones in which tar products were produced. Most of them were established towards 1837, for the production chiefly of coal naphtha, used for many purposes, and heavy oils, employed for the preservation of railway sleepers, by a process discovered by Mr. John Bethell, by means of which they are preserved twelve, fifteen, or even twenty years; whilst without it they decay after three or four years. I have much pleasure in calling your attention to a very remarkable and very complete work upon the creosoting of wood, by M. Forestier, chief engineer of the department of La Vendée, assisted by M. Marin, an engineer. These gentlemen have made, as you can see, numerous experiments, the result of which is that wood thus treated is preserved from decay in water as well as under ground, and, what is very important, it is no longer destroyed by that very destructive insect the *teredo*.

Lastly, there remains in the still (after the heavy oils and semi-solid substances have distilled off) a product which is fluid at the high temperature at which this operation is conducted, but which, when exposed to the natural temperature of the atmosphere, becomes hard and brittle, and is known under the name of pitch, and which is so largely employed in Paris under the name of asphalte, bitumen, &c., to form the foot pavements and public walks, as well as for the manufacture of a sort of combustible concrete, called in England patent fuel.

I now come to carbolic acid.

It is twenty years since Laurent, the eminent chemist, first pointed out the easy method of extracting carbolic acid from coal tar. It consisted in submitting the light oils to a fractional distillation and then treating with a concentrated solution of potash those products which distilled at a temperature between 160° and 200°, separating the alkaline solution from the hydrocarbons which floated on it, and then neutralizing by an acid which liberated the carbolic acid.

Such was Laurent's method of preparing carbolic or phenic acid, but pure carbolic acid was only there in a very small proportion; it was, in fact, a mixture composed chiefly of different liquids similar in properties and composition to carbolic acid, and, though Laurent succeeded in obtaining pure carbolic acid, still the process devised by him was too expensive to answer as a commercial production; and, besides, his method of operating was too complicated.

In 1847, Mansfield, and towards 1856, M. Bobœuf, made known processes which, in fact, were only a modification of Laurent's, for they consisted principally in employing caustic soda instead of potash, and in treating the whole of the light oils instead of a special portion, as Laurent had done; but by these processes a very impure acid was still obtained, from which it was very difficult, as experience has shown us, to extract pure carbolic acid; however, in a commercial point of view, the process of these gentlemen was a step in advance. I may add that it was this impure carbolic acid which Mr. John Bethell manufactured, at my request, about the year 1847; and it was this impure acid which was also employed by several chemists who, like myself, studied the properties of this substance, and who endeavoured to apply it usefully, either in the production of picric acid, or in preventing the transformation of tannic acid into gallic acid, in tanning substances, or, finally, in the preservation of subjects for the dissecting-room. M. Bobœuf also made use of it in preserving organic bodies from putrefaction, a property which has received of late very important applications.

In 1859, M. Marnas, of the firm of Guinon, Marnas, and Bonnet, of Lyons, came to Manchester, and asked me to furnish him with a purer carbolic acid than had been as yet manufactured. He showed me a white and crystalline product, which he gave as a specimen. It was then necessary to make new experiments, and I discovered that the best mode of preparation was not by treating light or heavy oils of tar with concentrated alkalies, but, on the contrary, treating the impure benzines of commerce or naphthas with weak alkaline solutions. By this means a semi-fluid, blackish product was obtained, a little heavier than water, of a density of 1·06, and which contained 50 per cent. of real carbolic acid, which acid I managed to

separate in part by careful distillation. It is this product which was employed by Messrs. Guinon, Marnas, and Bonnet, and others, till 1861, for the manufacture of colours derived from carbolic acid. At this period the colours obtained from aniline were so fine and brilliant that, to keep up a comparison with them, it was necessary to improve those derived from carbolic acid. To effect this it was necessary to improve the quality of the carbolic acid then manufactured, and, after some trials, we (F. C. Calvert and Co.) produced carbolic acid in white detached crystals, melting at between 26° and 27°; and I may here add that this is the product which is now generally employed in commerce and industry, for there are numerous examples of it at the present Universal Exhibition. In 1863 this relative purity was not sufficient. The same firm which had requested the improvements which I have before named asked us to try and make it still purer. We again set to work, and produced commercially Laurent's carbolic acid: that is to say, a substance melting at 34° C., and boiling exactly at 186°. This became a very important commercial product for us, and we delivered large quantities monthly.

From this time I made many efforts to draw the attention of medical men to the really remarkable therapeutic properties of carbolic acid, but the tarry and sulphurous smell which it still possessed was a serious obstacle to its application. I soon succeeded in overcoming this difficulty, and towards the end of the year 1864 our firm was in a position to deliver, in considerable quantities, carbolic acid deprived of sulphurous compounds, and therefore fit for all medicinal uses. But I am glad to say that the series of improvements in the manufacture of pure carbolic acid did not stop there, for towards the end of last year I discovered a process which now enables me to show you a product completely deprived of all disagreeable odour and tarry flavour, and, in fact, as pure, though extracted from tar, as if it had been produced artificially by the help of the reactions recently discovered by Messrs. Wurtz and Kékulé, based upon the direct transformation of benzine into carbolic acid, or by the well-known changes by which it may be obtained from salicylic acid or nitro-benzoic. This carbolic acid is distinguished from Laurent's in being soluble in 20 parts of water, whereas the latter requires 33. It is fusible at 41°, instead of 34°, and boils at 182°, instead of 186°, but it gives, like Laurent's, the blue colour described by M. Berthelot when mixed with ammonia, and to the solution is added a small quantity of a hypochlorite; the same effect is also produced when you expose to the vapours of hydrochloric acid a chip of deal soaked in this pure carbolic acid.

It was supposed that, as Laurent's acid had a constant boiling and crystallization point, it was a pure and definite substance. Now, the production of our new acid shows it is nothing of the kind, the product of Laurent being only a mixture of our pure carbolic acid and a liquid homologue; for when to the acid of Laurent is added a certain proportion of water, and the mixture is exposed to a temperature of 4° C., it deposits a crystalline substance in large octahedrons; this substance is a hydrate of carbolic or phenic alcohol, that is to say, carbolic acid combined with an equivalent of water of crystallization. This fact is important in a chemico-theoretical point of view, for it exhibits the only example known of an alcohol which, combining with water, forms a crystallized and solid hydrate. By removing from this hydrate the equivalent of water which it contains, carbolic acid is obtained in its purest state.

We will now rapidly glance at the applications which have been made of this product for sanitary purposes, in medicine, agriculture, and manufactures.

The disinfectant or rather antiseptic properties of carbolic acid are very remarkable. The beautiful researches and discoveries of M. Pasteur have shown that all fermentation and putrefaction is due to the presence of microscopical vegetables or animals, which, during their vitality, decompose or change the organic substances, so as to produce the effects which we witness, and carbolic acid exercises a most powerful destructive action upon these microscopic and primitive sources of life. Carbolic acid, therefore, is an antiseptic and disinfectant much more active and much more rational than those generally in use.

And allow me further to add that disinfectants, such as chlorine, permanganate of potash, or Condy-fluid, operate by oxidizing not only the gaseous products given off by putrefaction, but all organic matters with which they may come in contact; whilst carbolic acid, on the contrary, merely destroys the causes of putrefaction, without acting on the organic substances. The great difference which therefore distinguishes them is, that the former deals with the effects, the latter with the causes. Again, these small microscopic beings, these ferments, are always in small quantities as compared to the substances on which they act, consequently a very small quantity of carbolic acid is necessary to prevent the decomposition of substances; therefore its employment is both efficacious and economical. Moreover, carbolic acid is volatile; it meets with and destroys, as Dr. Jules Lemaire says, the germs or sporules which float in the atmosphere and vitiate it, and this cannot be the case with Condy's fluid, chloride of zinc or iron, which act only by contact, and are mere deodorizers. This is why carbolic acid was used with such marked success, and therefore so largely, in England, Belgium, and Holland during the prevalence of cholera and of the cattle plague. The antiseptic properties of carbolic acid are so powerful that $\frac{1}{2000}$ even $\frac{1}{5000}$ will prevent the decomposition, fermentation, or putrefaction for months of urine, blood, glue solution, flour, paste, fœces, &c., &c.; in fact, its vapour alone is sufficient to preserve meat in confined spaces for weeks; a little vapour of this useful substance will preserve meat for several days in the ordinary atmosphere, and prevent it being fly-blown; lastly, $\frac{1}{10000}$ has been found sufficient to keep sewage sweet; and I am proud to say that the British Government have decided to use exclusively our carbolic acid (as a disinfectant) not only on board Her Majesty's Navy, but in other Government departments. Although questions of public health are the province of medicine, still permit me to say a few words on the medicinal properties of carbolic acid. This question deserves to be treated thoroughly, for carbolic acid is susceptible of so many applications in this direction; its properties are so marked, so evident, and so remarkable, that they cannot be too much published, and it is rendering a service to mankind to make known the employment of so valuable a therapeutic agent.

I wish all who are listening to me were medical men, for I could show, by numerous and undeniable facts, the advantage they might derive from carbolic acid, and if my testimony was not sufficient to convince you, I would invoke the authority of men justly esteemed amongst you. I would recall to you the words of the good and learned Gratiolet and those of Dr. Lemaire, showing that carbolic acid is the most powerful acknowledged means of contending with contagious and pestilential diseases, such as cholera, typhus fever, small-pox, &c. Maladies of this order are very numerous, but in carbolic acid we find one of the most powerful agents for their prevention. Besides its antiseptic action, the caustic properties of carbolic acid are found useful; most beneficial effects are obtained from it in the treatment of very dangerous and sometimes mortal complaints, such as carbuncle, quinsy, diptheria, &c., as shown by Dr. Turner, of Manchester; and also in less severe affections, such as hœmorrhoids, internal and external fistulas, and other similar complaints. But what must be especially mentioned is the employment of carbolic acid in preserving in a healthy state certain purulent sores, and preventing the repulsive smell which comes from them, a smell which is the symptom of a change in the tissues of the flesh, and which often presents the greatest danger to the patient. The services which carbolic acid renders to surgery can be judged of by reading several most interesting papers lately published in the *Lancet* by Mr. Lister, F.R.S., on compound fractures, ulcers, &c., &c., and by visiting the two sick wards of Dr. Maisonneuve, at the Hôtel Dieu. Further, I must not overlook the valuable application made of it to gangrene in hospitals by the eminent Mr. Paget. Lastly, it has been used by many of the most eminent medical men with marked success in those scourges of humanity, phthisis and syphilis.

In agriculture our firm has stimulated the employment of the carbolic acid for the cure of certain diseases very common to sheep—scab, for example. The method of treatment customary in similar cases was very imperfect as well as dangerous, whilst with carbolic acid this malady is cured, and without danger to the animal, by dipping it for a minute, often only for some seconds, in water containing a small quantity of carbolic acid. For this purpose pure acid would be too expensive, and is not used, nor concentrated acid, which ignorant men who have the care of sheep would not know how to use, but by the help of soap an emulsion is made. After having shorn the sheep it is dipped in this mixture; a single immersion in a bath containing $\frac{1}{50}$ of it is sufficient to effect a cure. After scab, the foot-rot is one of the worst and most frequent complaints. Carbolic acid is also for that an efficacious remedy. For this a mixture is made of the acid and an adherent and greasy substance, capable of forming a plaster, which can be made to adhere to the animal's foot for two or three days, preventing the contact of the air, allowing time for the application to produce its effect. But if the flock be numerous, it would take a long time to dress the four feet of each animal one after another; so, to make it more easy, a shallow tray is made of stone—a sort of trough; this is filled with the medicated mixture, and the sheep are made to pass through it; their feet are thus impregnated with the required substance. Permit me also to state that cattle cease to be annoyed with flies, &c., if washed with this solution, or a weak solution of carbolic acid.

Manufacturers have not yet availed themselves of one tithe of the valuable properties of carbolic acid, and in this direction a new field is open to its use; still I may cite a few instances. The perservation of wood has been already referred to, and, thanks to its use, the great trade in skins and bones from Australia, Monte Video, Buenos Ayres, &c., is benefited. Wild animals living there in herds are slaughtered by thousands. Formerly they came to us in a bad state, half putrid, emitting an insupportable odour, and only fit for manure; in this state their price was not more than 150 francs the 1000 kilogrammes, now, thanks to carbolic acid treatment, they arrive perfectly preserved; they can be employed for all the uses to which green or raw bones are usually applied, and the value of bones is raised as much as from 250 to 300 francs. Hides also arrive putrid, unless they have been dried rapidly in the sun or salted, which necessitated a long and costly operation; whilst it is only necessary to immerse them for twenty-four hours in a solution of 2 per cent. of carbolic acid, and dry them in the air, to secure their preservation. It is probable that in a short time the blood, intestines, and other parts of these animals will be, by means of carbolic acid, converted into manure, and imported into this country. In England carbolic acid is used in the preservation of guts at the gut-works, for keeping anatomical subjects, and the preservation of all animal matter. Carbolic acid is also utilized in preventing the decomposition of the preparations of gelatine and albumen used in spinning, dyeing, and calico-printing.

One of the most interesting chapters in the history of carbolic acid is certainly that which treats of the production of colouring materials; they alone enter into comparison with those derived from aniline, and often enter into successful rivalry with them. Amongst the colouring matters derived from carbolic acid, the most important is, without fear of contradiction, picric acid. The discovery of this acid dates back to a distant period; it was studied by Welter, and was called Welter's bitter.

My illustrious master, M. Chevreul, resumed in 1807 the study of the action of nitric acid on organic matters, and showed, in an admirable paper, that picric acid was often produced when organic matters were acted upon by nitric acid. M. Chevreul discovered in the products of the oxidation of organic substances through nitric acid two different bodies, which he called *amer au minima* and *amer au maxima*, the latter being picric acid. This acid was again examined by Laurent in 1841. This profound chemist showed that the true generator of picric acid was carbolic acid; that in the action of nitric acid on the latter it formed three nitrogenated compounds, mononitrophenic acid, binitrophenic acid, trinitrophenic acid, the latter being also picric acid.

These interesting results of Laurent would perhaps have remained for a long time without any commercial value, if picric acid had not been applied to dyeing, in 1847, by M. Guinon, sen., of Lyons. Since then the use of this acid has been much extended, not only in producing magnificent yellows, but also, joined with indigo, in the production of ordinary greens, or of *vert Lamière* with Prussian blue, so that its consumption may be valued at from 80 to 100,000 kilogrammes annually; our firm alone produces more than 300 kilogrammes weekly; and when it is considered that 1 kilogramme of picric acid dyes to an intense shade 70 to 100 kilogrammes of silk, or 40 to 50 kilogrammes of wool, the enormous quantity of textile materials dyed by this single product may be appreciated.

The processes used for the preparation of picric acid are still those which Laurent indicated in 1841; but instead of using carbolic acid loaded with the heavy oils of tar, as M. Guinon had done, I sought to diminish the quantity of nitric acid, employed in mere waste, on the heavy oils of tar, which were then mixed with carbolic acid, and I am glad to say that since 1852 I have used, in the manufacture of picric acid, carbolic acid containing only some of its liquid homologues. In 1856, M. Bobœuf took out a patent in France for making picric with carbolic acid. But picric acid was then at a high price, and it is only since our firm has obtained carbonic acid cheap that picric acid can be produced freed of all those resinous materials which prevent its purification and low price; in fact, owing to our pure carbolic acid, picric acid is now manufactured chemically pure; this product, which was sold some years since at 30 to 40 francs the kilogramme, is now sold at the rate of 10 francs. Further, I may add that to apply it in a quick and economical manner it is desirable to add to the dye bath a small proportion of sulphuric acid; this method of manipulation, which is not

generally known, is very important, for it is only in this way that the textile materials can be readily dyed, and the baths exhausted.

I shall now have the pleasure of calling your attention to the production of two new colouring substances derived from picric acid:—

1. Picramic acid was, in the first instance, obtained by Wölher; by making sulphate of iron act upon picric acid, and neutralizing with caustic barytes, a deep brown salt was thus produced, from which he separated the barytes by the help of sulphuric acid, and by these reactions M. Wöhler obtained an acid to which he gave the name of nitro-hematic acid; but it is to M. Aimé Girard that we owe the practical process by means of which we are able to manufacture great quantities of picramic acid. This acid imparts to silk a beautiful series of brown tints, similar to those obtained from catechu.

2. Isopurpurate of ammonia. It is with much pleasure that I noticed, at the Exhibition, in M. Casthelaz's case, a coloured material, known in the trade by the name of soluble garnet, which, I am informed, is used especially by M. Chalamel, of Puteaux; this substance is particularly remarkable, as it is isomeric with the *purpurate of ammonia or murexide*. Although the preparation of this colouring material was first pointed out by M. Carey, still it is really due to a previous discovery, by Hlasiwitz, who called attention to the reaction of cyanide of potassium upon picric acid, and to which chemical reaction we owe the knowledge of manufacturing the isopurpurate for industrial purposes.

Before taking leave of picric acid it may not be without interest that I should state a curious application which has been made of the explosive property of its salts. During these last few years the picrate of potassium has been employed in great quantities, by Mr. J. Whitworth, for charging the bombs for destroying the iron plating of ships. When the projectiles thus prepared strike the iron masses, the enormous propelling force with which they are expelled from the gun is instantaneously converted into heat, and to such an extent that the ball becomes red hot, the heat decomposes the picrate of potash, and a violent explosion ensues, owing to the enormous quantities of vapours and gases which are generated in an instant of time. Whilst the alkaline picrates are endowed with such formidable properties, they also possess properties which are useful for the alleviation of human misery. Picric acid is an efficacious remedy in intermittent fevers. Persons affected with such types of fever, upon whom quinine has lost all its beneficial effects by continuous usage of it—and this is the case with some of our soldiers who return from India—derive, I am glad to say, wonderful benefit from the use of picric acid and picrates, as Dr. Aspland has proved to be the case at the military hospital at Dukinfield. The knowledge of this fact may be useful in districts in which exist poor populations, for it affords them a cheap febrifuge; and, moreover, picric acid is not dangerous, as arsenical preparations are, nor does it derange the stomach like quinine.

To return to the colours derived from carbolic acid, allow me to remind you that when, in 1834, Runge discovered that acid amongst the products of coal tar, he observed at the same time the existence of two colouring substances, to which he gave the name of rosolic acid and brunolic acid.

I will not detail here the processes by which Runge extracted these substances from the residue of coal tar by means of lime, nor the method adopted by Messrs. Smith, Dussart, and Jourdin for producing these substances by direct oxidation of phenic or carbolic acid, but will describe rapidly the process which we now use to manufacture rosolic acid, and which should not be attributed, as is generally believed, to M. Kolbe, as it is due to M. Jules Persoz, the son of the celebrated professor of tinctorial chemistry in the Conservatoire des Arts et Métiers. His process consists in making oxalic acid act upon sulphophenic acid at a temperature of about 160° and the product which results from it has the bronze green appearance of cantharides. To render it suitable for employment in dyeing, it is only necessary to wash it so as to separate from it all the sulphuric acid with which it is contaminated. It is then known under the name of yellow coralline or aurine. It was our firm who first, in 1863, discovered that rosolic acid thus prepared could be employed directly as a dye, and introduced it to dyers under name of aurine. This substance gives to silk and albumenized cotton magnificent orange colours, like those of basic chromate of lead or of turmeric. In 1860, M. Persoz, jun., discovered also that if rosolic acid was heated under pressure with ammonia it gave rise to a red substances, which he called *péonine*. Messrs. Guinon, Marnas, and Bonnet perfected the manufacture of *péonine*, and gave it the name of red coralline. This colouring substance gives to silk and worsted a flame-coloured tint and very brilliant scarlets. This firm were also the first to produce and introduce, towards the end of 1860, a blue dye, derived from carbolic acid, or, more so, resolic acid, which they called azuline. Azuline is obtained by heating for several hours, at the temperature of about 180°, a mixture of rosolic acid and aniline. It is only necessary then to treat this product with sulphuric acid, and to wash it with benzine, to produce a beautiful blue colouring matter, which presents, when dry, a red mass with gold-coloured tints. Azuline, although discovered before the aniline blues, which have since become formidable rivals to it, is still, I may add, manufactured in competition with them.

To Messrs. Guinon, Marnas, and Bonnet is also due the first production of a green derived from coal-tar products. It was manufactured in 1863, therefore some months before the appearance of an aniline green, known as *vert d'Usèbe*, which, however, with the exception of the iodine greens, is the only one now employed in dyeing. Viridine was obtained by this firm from a mixture of aniline, benzoic, and resolic acids.

Phenicienne, discovered in 1863 by M. Roth, is another colouring matter derived from phenic acid; it produces fast colours, from a deep garnet red to a golden buff. Phenicienne is produced by the action of nitrosulphuric upon carbolic acid. I will now, with your permission, gentlemen, leave for a few seconds the products derived from phenic acid, in order to place before you certain claims to some inventions not sufficiently recognized by writers on aniline colours.

In 1860, Messrs. Clift, Lowe, and I, took out a patent for the direct production on prints, of a green called emeraldine, and the deep blue called azurine, a blue which resembles indigo, and which really, when printed in a concentrated form, may be confounded with a black. And although I do not desire to deprive Messrs. Lightfoot, Carlos Kœchlin, and Lanth, of any of the merit which belongs to them for the production of the beautiful black which every one must have admired in the Exhibition, still I may be permitted to remark that their process is based upon the oxidation of aniline by chlorate of potash, and is therefore based on our patent, previously secured to their discoverers. The difference between their process and ours consists in the addition of a salt of copper, which addition is so important that I have no hesitation in saying it has decided the success of a black which now stands unrivalled.

I cannot conclude this retrospective review without calling your attention to a fact which seems to have escaped my colleagues; it is that the majority of the beautiful colours obtained from aniline are due to the industrial application of a discovery made by your illustrious president, M. Dumas, more than thirty years since. The discovery I mean is the principle, so rich and fruitful, which he named the law of substitutions—a law which has thrown so bright a light on modern chemistry, and which has prepared the way for such brilliant achievements, and which, I say, has also been the foundation of the production of the beautiful colouring substances which we all so much admire. Thus, in order to obtain aniline blues, violets, and greens, produced by the methods devised by the illustrious chemist, Dr. Hofmann, we substitute for a certain proportion of the hydrogen of rosaniline, an equivalent quantity of the alcoholic radicals, called phenyl, ethyl, methyl, and amyl. Further, this celebrated chemist has also shown that the blues obtained by Messrs. Girard and Delaire are also due to the same laws.

I am far, I regret to say, gentlemen, from having named all the remarkable properties and applications of carbolic or phenic acid; but I trust I have succeeded in making you share my enthusiasm for this valuable agent, which, after having rendered important services to most of the world's industries, still offers to chemists and to manufacturers a wide field for new applications.*—*Journal of Society of Arts.*

SANDRINGHAM.—This royal residence has been recently very much enlarged, and, with the view of adding to the comfort of his residence and of having every modern convenience, H.R.H. the Prince of Wales determined to have the buildings lighted with gas. The site selected for the gas-works is near the new farm buildings, about half a mile from the hall. The retort-house, purifying-house, lime-store, coke and coal stores, workshop, and gas-fitting stores, constitute one block of buildings, designed and built, in the tasteful mode peculiar to that part of Norfolk, with carstone and brick edgings. Carstone appears to be a peculiar form of iron ore, too "poor" to pay for purposes of iron manufacture. The whole of the apparatus—gas-holder, purifiers, condenser, &c.—are of very handsome though neat design, and made from specially prepared models; and, as it is of essential importance, arrangements have been made for the gas to be of extreme purity and of high illuminating power. Cannel coal is used entirely. A capacious main is carried from the works to the front of the hall, where it branches into two mains, which are carried into the buildings, and ramify throughout, valves being so placed that the gas supply to different sections may be cut off. The kitchens and confectioneries have a number of gas-cooking stoves. Excepting the private apartments of their royal highnesses, all the rooms, hall passages, corridors, dormitories, and closets are being lighted with gas. Gas is being laid into the billiard-room, bowling-alley, &c., and, when the cellars are completed, they also will be lighted. A main is carried to the stables, which are lighted throughout. Arrangements are made for using gas for a variety of stable purposes, the harness-rooms, carriage-houses, dormitories for grooms and others, are all lighted; together with a large room used for social parties of the servants of the estate, Christmas-trees, &c., in which the Prince and Princess take much interest. Indeed, if the character of any one is to be judged by the feeling towards them of their household and their neighbours, the kindly and affectionate manner in which they are regarded in their neighbourhood speaks volumes in their favour. A main is carried to the equerries cottage, and another main, upwards of three-quarters of a mile in another direction, to the residence of General Sir W. Knollys, both of which residences are now being fitted for gas. As the main passes Sandringham church and the rectory, branches are left to light both, together with the school-room, when required. Lamp-columns of a new and tasteful design are being fixed all over the grounds, and a main is carried to the Norwich Gates, which will be lighted with lamps specially designed. The new farm buildings already alluded to are of the most modern construction, comprising every improvement for the wants of agriculture. The Prince takes much interest in these matters; everything that is done is previously submitted for his approval. All the stables for farm horses, cow-sheds, piggeries, and the other buildings, are lighted with gas. The gas-works were constructed at the Midland Iron-Works of Messrs. C. and W. Walker, Donnington, near Newport, Shropshire.

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* Dr. Calvert has supplied the Editor with the following additional remarks explanatory of the distinctions between *deodorizers, disinfectants, and antiseptics*:—

We beg to offer the following remarks in reference to the peculiar advantages which carbolic acid possesses as an antiseptic, disinfectant, and deodorizer, as compared with substances which act only as disinfectants—such as bleaching powder and sulphurous acid, or with those substances which are deodorizers—as chloride of manganese, green copperas, nitrate of lead, &c.

Deodorizers.—All substances merely acting as such are neither disinfectants nor antiseptics, as they simply remove the noxious gases emitted from organic matters whilst in a state of decay or putrefaction, and as they do not possess the property of arresting decomposition or fermentation, it is no proof that the source of infection has been destroyed, for noxious smells and offensive gases are not themselves the real source of contagion, but merely indicators of its existence—the real source of disease and contagion being due, as proved by the latest investigations in science, to microscopic spores floating in the atmosphere, and which by their ulterior development and propagation, are believed to be the true source of contagion.

Disinfectants.—Under this head may be classed bleaching powder or chloride of lime, sulphurous acid and permanganate of potash: they first act as deodorizers, and then as disinfectants, because if employed in large quantities they will so thoroughly oxidize or act upon organic matters as to prevent them from again entering, at least for a short period, into decomposition, but if the organic substances so acted upon are exposed to the atmosphere, they will again experience decay and putrefaction.

Antiseptics.—Antiseptics, such as corrosive sublimate, arsenious acid, essential oils, carbolic acid, &c., act as such by destroying all source of decay and decomposition; that is to say, they will destroy or prevent the formation of the germs of putrefaction and fermentation, without acting upon the mineral or vegetable matters present. The advantage of their use is, therefore, that they act, when used in small quantities, upon all organic matters in a state of decay; further they are deodorizers, for they prevent the formation of offensive odours, and consequently they may be considered as antiseptics, disinfectants, and deodorizers. The great advantages which carbolic acid possesses over all other antiseptices are, that it cannot be used for any illegal purpose, as arsenic and corrosive sublimate; and further, that its antiseptic properties are so powerful, that a few thousandths of it will effectually prevent the putrefaction of substances such as glue, blood, urine, fæces, and the fermentation of all vegetable matters, such as flour, starch, sugar, &c., &c.

Owing to the inducements which have been held out by some traders, large quantities of a fictitious mixture have been sold to the public as carbolic acid. To enable purchasers to protect themselves from fraud, the following test is supplied on the authority of Mr. W. Crookes, F.R.S.:—"Commercial carbolic acid is soluble in from 25 to 70 parts of water, or in twice its bulk of a solution of caustic soda, while oil of tar is nearly insoluble. To apply these tests:—1. Put a teaspoonful of the carbolic acid in a bottle; pour on it half a pint of warm water; shake the bottle at intervals for half an hour, when the amount of oily residue will show the impurity. 2. Dissolve one part of caustic soda in ten parts of warm water, and shake it up with five parts of the carbolic acid. As before, the residue will indicate the amount of impurity. These tests are not given as having any pretension to scientific accuracy, but as affording persons who are desirous of using carbolic acid a rough and ready means of seeing whether or not they possess the right article."

REPORT OF AN EXAMINATION OF THE AIR IN THE TUNNELS OF THE METROPOLITAN RAILWAY.

Having received instructions from the directors of the Metropolitan Railway Company, through Messrs. Burchell, their solicitors, by letter addressed to Dr. Bachhoffner, to examined and report the state of the atmosphere in the different tunnels on their line, and on the sanitary condition generally of the stations and tunnels, we beg to present the following as the result of our investigations:—

We proceeded in the first instance to obtain samples of the air in the tunnels, and we collected them on three separate occasions—namely, first, immediately after the trains had ceased running at night; secondly, just before they commenced running in the morning; and, thirdly, in the afternoon between four and five o'clock, the period of the day when there is generally the largest amount of traffic.

The samples, twenty-eight in number, were taken at different places in each tunnel, and at different altitudes; some near the crown of the arch, some near the ground, and others on a level with the heads of the passengers. These samples were analyzed for sulphurous acid, carbonic acid, carbonic oxide, coal gas, and oxygen.

The presence of sulphurous acid was sought for by the most delicate chemical test with which we are acquainted—namely, its action upon iodic acid and starch, which we have ascertained is capable of showing the presence of one part by volume of sulphurous acid in 100,000 parts of air, but we could not in any case discover by such test the presence of this acid; from which we conclude that its volume was less than the above in the tunnels. The proportion of carbonic acid by volume in 10,000 parts of the air in the several tunnels and stations was as follows:—

	Max.	Min.	Mean.
Tunnel between Bishop's Road and Edgware Road, 2 a.m. Sept. 3	4·1	4·1	4·1
Tunnel between Edgware Road and Baker Street . . . 1 to 3 a.m. Sept. 3	5·2	4·3	4·8
2 to 4 a.m. Sept. 6	5·4	4·7	5·0
4 p.m. Sept. 7	..	..	5·7
Baker Street station 4 p.m. Sept. 10	..	..	6·2
Tunnel between Baker Street and Portland Road . . . 1 to 3 a.m. Sept. 3	6·0	4·6	5·1
2 to 4 a.m. Sept. 6	4·5	4·2	4·4
4 p.m. Sept. 7	..	..	6·9
Tunnel between Portland Road and Gower Street . . . 1 to 3 a.m. Sept. 3	6·0	5·1	5·5
2 to 4 a.m. Sept. 6	6·1	4·5	5·1
4 p.m. Sept. 7	..	..	12·7
Gower Street station 4 p.m. Sept. 7	..	..	5·7
Tunnel between Gower Street and King's Cross . . . 1 to 3 a.m. Sept. 3	5·4	4·4	4·9
2 to 4 a.m. Sept. 6	5·2	4·3	4·6
4 p.m. Sept. 7	..	..	9·1

The amounts of carbohydrogen (coal gas) and of carbonic oxide present were so small as to be barely discoverable by the most delicate processes of analysis. Lastly, we ascertained that the amount of oxygen in the air of the tunnels and stations was not in any case deficient.

These results prove that in no instance was the air found to be vitiated to any material extent, although it will be seen that the air taken in the afternoon was less pure than that taken at night. The researches of Regnault, Bunsen, and other eminent chemists, and more recently those of Dr. Angus Smith, show that what may be termed "model or normal atmospheric air" in cities and large towns consists in every 10,000 parts by volume of

Oxygen	2096
Nitrogen	7900
Carbonic acid	4
	10,000

It is the last constituent which, when in excess, renders the air impure, and, in proportion to its increase, so is the air made unfit for respiration. Experiments conducted by Dr. Bernays and Dr. Angus Smith have shown that in several of our London theatres at about 10 o'clock p.m., in many other places of public resort, and especially in some of our law courts, the quantity of carbonic acid in the atmosphere of those places varied from 10 to 32 parts per 10,000; and from the Army Report (vol. v., page 272) it appears that in some fairly-ventilated barracks at Aldershot, the quantity of carbonic acid at midnight amounted to 6·42 per 10,000 of air, and at 5 p.m. it amounted to 7·59 per 10,000. Even in the streets of Manchester, in foggy weather, it has amounted to 8 parts per 10,000 of air.

In order to determine the atmospheric conditions of these tunnels by comparison with the condition of the air in the tunnels of other lines of railway, we took samples of the air from several tunnels near London; and from these, which we designate by numbers only, we obtained the subjoined results:—

Tunnel No.	1— 4·7	carbonic acid per	10,000	of air by volume.
" "	2—12·1	"	"	"
" "	3— 4·6	"	"	"
" "	4— 4·3	"	"	"
" "	5— 7·8	"	"	"
" "	6— 4·5	"	"	"
" "	7— 5·3	"	"	"
" "	8— 4·3	"	"	"
" "	9— 4·2	"	"	"
" "	10— 5·1	"	"	"
" "	11— 4·3	"	"	"
" "	12— 4·2	"	"	"
" "	13— 4·6	"	"	"

Our inquiries were next directed to the quality and quantity of the fuel used in the engines, and to the mode by which its combustion is effected. The plan adopted (with which we cordially agree) is to diminish as far as practicable the combustion of the fuel during the passage of the trains through the tunnels and stations. The steam in the boiler is raised in the open air to a temperature and pressure which, by experience and daily practice, is found sufficient to work the trains through the tunnels; and, when the trains come again into open space, fresh steam is then generated sufficient to propel the trains through the next journey, when the process is again repeated; by which means the engine-driver is enabled, when passing through the tunnels and stations, to close the fire-box and damper so as merely to keep the fire in such a condition that it may be easily revived at either end of the journey.

The evolution of the products of combustion is thus almost entirely confined to that portion of the journey when the trains are passing through the open spaces.

The coke is of a superior quality, being made from a coal which is known to be more than usually free from iron pyrites, and it is burnt in the ovens for twenty-four hours longer than the ordinary coke generally used upon railways. In addition to which a staff of eight men and a foreman are constantly employed in examining and selecting the coke, so as to ensure that none but the best quality of coke is transmitted to London for the use of the Underground Railway.

To determine the per centage of sulphur in the coke, thirteen samples were submitted to chemical analysis, and these gave an average proportion of 0·26 per cent. of sulphur, which is about one-fourth the quantity found in ordinary coke. As regards the coke, therefore, we see nothing to which we can take exception, but, on the contrary, we are of opinion that the best available means are used for obtaining a fuel as free from deleterious matter as possible, in addition to which the combustion of the same is conducted with the view of preventing as far as possible the escape of offensive gases.

The presence of sulphur, or, more correctly speaking, of sulphurous acid gas, in the tunnels and stations, which at times is appreciable both to taste and smell, more particularly on those days when the external atmosphere is unusually dense, must not be taken as an indication that this gas exists in dangerous quantities, for as little as one part of this gas in 100,000 parts of atmospheric air is strongly preceptible both to taste and smell; and paper moistened with a solution of iodic acid and starch becomes tinged with a blue colour when exposed for a few minutes to air having the above proportion of sulphurous acid. On several occasions we have exposed this delicate test to the air in the tunnels while passing through them, both in the carriages and on the engines; and, although the quantity of air thus brought into contact with the test has been considerable, yet, it has only been during the time of active traffic that the test has shown the presence of sulphurous acid, and then in an insignificant degree. In addition to the above, we beg to point out another cause which communicates to the air, more particularly in the stations, a pungent smell, which, although disagreeable, cannot in the slightest degree be regarded as injurious to health; we allude to the partial combustion of the wood forming the breaks when acting upon the tires of the wheels in checking the speed of the train as it approaches the stations.

The number of trips made by the trains through the tunnels daily amounts to 358, of which 284 are by the narrow-gauge trains, and 74 by the broad-gauge. Each of the narrow-gauge trains occupies 20,000 cubic feet of space, and those of the broad-gauge 23,000 cubic feet. The length of time occupied by each train in passing through the tunnels and stations is ten minutes. There are numerous openings communicating with the external atmosphere above, amounting in the aggregate to 3164 square feet, and distributed in the following manner—namely, Baker Street station, 1362 square feet; Portland Road station, 863 square feet; Gower Street station, 939 square feet. The western end of the tunnel at Edgware Road opens into a large area called the Yard, and at the eastern end of the tunnel at King's Cross an opening has been made directly into the atmosphere, 40 feet in width, in addition. By an extensive series of thermometric observations, we find that there is an average difference of about 1·7° Fahr. between the temperature of the tunnels and that of the external atmosphere; the mean outside temperature being 70° Fahr., while the air in the tunnels had a mean temperature of 68·3° Fahr., so that it was 1·7° Fahr. colder than the external atmosphere. During the winter months this condition will possibly be reversed; but in either case there will be a rapid change of air by an ascending and descending current. Having regard to the cubical volume of the trains, the short time occupied by them in passing through the tunnels and stations, the large volume of air which they displace, and the increased impetus given to the horizontal movement of the air by the rapidity of their transit, we are of opinion that the vitiation of the atmosphere cannot be of a serious character, and this accords with the results of our analysis.

A careful inspection of the tunnels has also shown that they are well constructed, and are generally dry and free from infiltration of liquid or other matter prejudicial to health, with the exception of a portion of the tunnel between Portland Road and Gower Street; to this we directed the attention of Mr. Fenton immediately after our first inspection; and we are happy to be able to add that the defect was at once attended to, and is now in a perfect sanitary condition.

We find on inquiry that the general health of the *employés* is such as to afford unquestionable proof of the sanitary condition of the air in the tunnels. From a statement furnished to us by Mr. Fenton, it appears that the per centage of sickness and mortality of these persons is considerably less than that of the *employés* on the Great Western Railway. To this fact we may add the results of our own personal inquiries, which fully confirm it, as many of the engine-drivers and guards have, we find, been in the service of the company since the opening of the line. They are to all external appearance robust healthy men, and they have assured us that since they were first appointed they have scarcely had a day's illness.

From the foregoing facts, we are enabled confidently to state that the atmosphere of the Metropolitan Railway is not unwholesome or injurious to health.

(Signed) GEO. H. BACHHOFFNER, Ph.D., F.C.S., &c.
HY. LETHEBY, M.B., M.A., &c., Professor of Chemistry in the College of the London Hospital, and Medical Officer of Health for the City of London.
J. WHITMORE, M.D., &c., Medical Officer of Health and Chemical Examiner of Gas for the Parish of St. Marylebone.

London, Oct. 23, 1867.

INSTITUTION OF CIVIL ENGINEERS.—The first meeting of the session 1867-68 was held on Nov. 12, and occupied by the reading of a supplement to and the discussion upon the paper, "Experiments on the Removal of Organic and Inorganic Substances in Water," by Mr. Edward Byrne, M.I.C.E., which was read at the close of the last session. The author now gave an account of experiments he had since made on the well-known filtering materials, magnetic carbide and silicated carbon; and, after recording the results in a tabular form, he proceeded to make a comparison between those substances and animal charcoal. His experiments were to the effect that the action of the magnetic carbide was exceedingly feeble as regarded the removal of organic and inorganic impurities, and that it did not possess the property of softening the water except to a very small extent; whereas, this property was possessed in a high degree by the two other filterings materials. Silicated carbon, however, quickly lost this power, and after a short time it rendered the water positively harder than it was before filtration. Animal

charcoal, in its softening property, was not only more powerful than the silicated carbon, but more permanent in its action; and so far as the experiments went, it continued to remove inorganic matter. After a short time, however, it commenced to give back a portion of the organic impurity which it had previously removed. The silicated carbon, too, was found, in an equally short time, to give back not only the organic, but also the inorganic, matter which it had previously taken up. To decide whether the organic matter contained in the water, so far as the nitrogen was concerned, had undergone any oxidation by its passage through these substances, the amount of nitrogen in the original water, and in that passed through each filter, was determined by the process which Professor Wanklyn had recently made known. By this extremely delicate test it was found that, for equal quantities of organic impurity, the amount of albuminous matter in the original and in the filtered waters was precisely the same; which fact was considered a sufficiently clear proof that the organic matter contained in the water had undergone no change by its percolation through these filtering materials. The author then expressed the opinion that while filtration must ever be considered most valuable for the removal of matter in mechanical suspension, it was practically useless as a means of removing substances in solution. He argued that the deductions to be drawn from these experiments, though made on a small scale, would, by reason of the systematic manner in which they were conducted, be safely applicable to cases of far greater magnitude. He concluded by expressing a hope, that the result of these investigations would serve the purpose of pointing out the danger of depending too much on the system generally of filtration, as well as of exposing the inconsistency of bringing home foul water to undergo a delusive method of purification, instead of adopting the proper and only satisfactory plan of procuring water which was itself naturally pure.

DR. HILLIER'S REPORT ON THE GAS SUPPLIED BY THE IMPERIAL COMPANY TO THE VESTRY OF ST. PANCRAS DURING THE MONTH OF OCTOBER, 1867:—

Date.	Number of Observations.	Average Light in Candles produced by 5 Ft. of Gas per Hour.	Light in Candles reduced to Consumption of 120 Grs. per Hour.	Traces of Ammonia.	Traces of Sulphuretted Hydrogen.
Oct. 1	10	15·0	14·3	Yes.	No.
2	10	14·2	14·2	,,	,,
4	10	13·7	15·1	,,	,,
8	10	13·8	15·2	,,	,,
11	10	14·8	13·3	,,	,,
12	10	14·2	14·2	,,	,,
14	10	14·0	14·0	,,	,,
16	10	13·8	15·2	,,	,,
18	10	14·6	14·6	,,	,,
21	10	14·4	14·4	,,	,,
23	10	14·5	14·5	,,	,,
25	10	14·6	14·6	,,	,,
28	10	13·6	14·9	,,	,,
30	10	12·8	14·7	,,	,,

During October the gas examined on fourteen days was found, as the mean of 140 observations, to have an illuminating power of 14·5 standard sperm candles, burning at the prescribed rate per minute. The lowest result obtained on any day was 13·2, and the highest 15·2. Ammonia was constantly present. Sulphuretted hydrogen was not detected. The sulphur in 100 cubic feet of gas amounted to 6·7 grains.

DR. WHITMORE'S REPORT ON THE QUALITY OF THE GAS SUPPLIED IN ST. MARYLEBONE, IN OCTOBER, 1867:—

October.	Illuminating Power in Sperm Candles.			Mean Pressure in 10ths of an inch.	
	*Mean of 27 Observations.	Highest.	Lowest.	Highest.	Lowest.
Imperial Company's gas	15·05	15·98	14·51	19·48	5·25
Chartered Co.'s common gas . .	13·02	13·85	12·32	31·71	13·33
Chartered Co.'s cannel gas . . .	20·96	22·22	20·18	29·36	10·38

* Each observation consists of 10 readings of the photometer.

The above results were obtained from the gas of the Imperial Company, manufactured at their Fulham works, and from the common and cannel gas of the Chartered Company, manufactured at their works in the Horseferry Road, Westminster. The mean illuminating power of the Imperial Company's gas during the month was fully 3 candles above the legal standard; on no occasion was it less than 14 candles. Its pressure and purity were both satisfactory. The Chartered Company's common gas gave an illuminating power equal to 13 candles, or 1 candle above the standard, and on no occasion did it fall below it. The pressure was also high; but a mean of three careful analyses gave sulphur slightly in excess of what the law permits. The illuminating power of the cannel gas was 1 candle in excess of the standard; its pressure and purity were also good. In the course of the month complaints were made to me by several consumers—tradesmen of Oxford Street, and others—of their inability, on several occasions, to obtain the usual amount of light. This deficiency I ascertained arose from no want of illuminating power, but from a partial choking up of several of the mains with naphthaline, produced probably by sudden change in the temperature. This impurity, which sometimes accumulates in large quantities, is a source of great trouble and annoyance to the gas officials, inasmuch as its removal is attended with considerable trouble and expense. Within the last week, however, it has been got rid of, and I have received no further complaints on the subject.

DR. WHITMORE'S REPORT ON THE QUALITY OF THE WATER SUPPLIED IN ST. MARYLEBONE, IN OCTOBER, 1867:—

October.	Total Solid Matter in degrees or grains per Imperial gallon.		* Loss by Incineration of Solid Matter in previous column.		Ammonia.
	Oct., 1866. 0°	Oct., 1867. 0°	Oct., 1866. 0°	Oct., 1867. 0°	0°
Distilled Water . . .					
West Middlesex water	20·16	16·96	0·56	0·60	—
Grand Junction water	20·28	17·68	0·64	0·68	—

* The loss by incineration represents the amount of organic and other volatile matters contained in an Imperial gallon (70,000 grains) of water.

COMPOSITION AND QUALITY OF THE METROPOLITAN WATERS, IN OCTOBER, 1867.—The following are the returns of the Metropolitan Association of Medical Officers of Health:—

Names of Water Companies.	Total Solid Matter per Gallon.	Loss by Ignition.*	Oxidizable Organic Matter.†	Hardness.		Organic and other Ammonia.
				Before Boiling.	After Boiling.	
Thames Water Comps.	Grs.	Grs.	Grs.	Degs.	Degs.	Grs.
Grand Junction. . . .	19·67	1·00	0·56	13·5	4·5	0·004
West Middlesex	16·67	0·85	0·52	12·5	4·0	0·004
Southwark and Vauxhall.	16·50	1·00	0·59	13·0	4·5	0·004
Lambeth	19·00	1·25	0·60	13·5	4·5	0·004
Other Companies.						
Kent	27·50	0·75	0·26	18·0	7·5	0·000
New River	17·00	0·25	0·31	12·0	3·0	0·001
East London.	19·20	0·50	0·49	13·0	4·5	0·001
Surface Wells.						
Idol Lane, by Church . .	81·33	2·00	0·06	32·0	16·0	0·004
Leadenhall Street . . .	120·00	11·51	1·51	50·0	—	1·281
Dunning's Alley . . .	74·67	8·00	0·96	36·0	—	0·008

HY. LETHEBY, M.B.

* The loss by ignition represents a variety of volatile matters, as well as organic matter, as ammoniacal salts, moisture, and the volatile constituents of nitrates and nitrites.

† The oxidizable organic matter is determined by a standard solution of permanganate of potash—the available oxygen of which is to the organic matter as 1 is to 8; and the results are controlled by the examination of the colour of the water when seen through a glass tube 2 feet in length and 2 inches in diameter.

DR. FRANKLAND'S ANALYSIS OF THE METROPOLITAN WATERS IN OCTOBER, 1867.—"Royal College of Chemistry, Oct. 31, 1867.—Sir,—I have the honour to submit to you in the following table the results of the chemical examination of the waters supplied to the metropolis during the month of October. For the purpose of comparison I append also the results yielded by Loch Katrine water, as supplied to Glasgow, and by the water supplied to the town of Lancaster, when submitted to the same analytical processes:—

Companies.	Date and Place of Collection.	Total Solid Impurity in 100,000 Parts.	Organic Carbon.	Nitrogen, as Nitrates and Nitrites.	Ammonia.	Total combined Nitrogen.	Previous Sewage Contamination (Estimated).	Total Hardness.
Thames.								
helsea.....	Oct. 2—Cab Rank, Horse Guards ...	26·28	·304	·202	·001	·212	1045	17·5
West Middlesex	Oct. 2—Cab Rank, Portland Road ...	23·70	·258	·136	·001	·140	385	16·0
Southwark & Vauxhall..	Oct. 2—Barclay's Brewery	25·90	·261	·167	·002	·210	705	16·0
Grand Junction.....	Oct. 9—Cab Rank, Woodstock Street	25·10	·224	·141	·001	·145	435	17·5
Lambeth....	Oct. 9—Cab Rank, Lambeth Road...	26·90	·218	·207	·002	·230	1105	18·9
Other Sources								
New River ..	Oct. 22—Cab Rank, Tottenham Ct. Rd.	26·60	·129	·219	·001	·224	1215	18·7
East London.	Oct. 15—Slater's Lamp-black Wks. Old Ford Road ..	27·22	·164	·108	·001	·118	105	20·5
Kent.....	Oct. 9—Deptford Railway Station .	41·74	·120	·345	·000	·348	2465	25·8
Loch Katrine	Feb.—Glasgow	3·28	·256	·031	·002	·041	0	0·30
Lancaster ...	Sept.—Lancaster ..	3·54	·157	·036	·001	·038	0	0·1
Column 1	2	3	4	5	6	7	8	9

The numbers in columns 3, 4, 5, 6, 7, 8, and 9 all relate to 100,000 parts of the waters. The table is to be read thus: 100,000 lbs. of Chelsea water collected on Oct. 2 at the Horse Guards cab rank contained 26·28 lbs. of solid impurity; the organic matter, constituting a portion of this impurity, contained ·304 lb. carbon. This solid impurity also contained ·202 lb. of nitrogen in the form of nitrates and nitrites, besides ·001 lb. of ammonia, whilst the total amount of *combined* nitrogen in every form was ·212 lb. The above quantity of water supplied by the Chelsea Company had been, after its descent to the earth as rain, contaminated with sewage or manure matter equivalent to 1045 lbs. of average filtered London sewage. By gradual oxidation, partly in the pores of the soils, partly in the reservoirs, filters, and conduits of the company, this sewage contamination had been converted into comparatively innocuous inorganic compounds before its delivery to consumers. Finally, 100,000 lbs. of the Chelsea Company's water contained 17·5 lbs. of carbonate of lime, or an equivalent quantity of other soap-destroying ingredients. The Southwark Company's water, which has hitherto been always turbid, is this month perfectly clear and transparent; but the waters delivered by the Chelsea, Grand Junction, and Lambeth Companies were all contaminated by suspended matter, showing imperfect filtration. It is of the utmost importance that the water supplied to London from rivers contaminated by sewage should be filtered with great care before delivery. The Kent Company's water had a milky appearance, due in all probability to the separation of carbonate of lime, with which this water is highly charged.—I have, &c., E. FRANKLAND.—The Registrar-General, &c."

THE GASLIGHT IMPROVEMENT COMPANY, LIMITED.—By an order made by the Master of the Rolls, dated the 9th day of November, 1867, on the petition of George Bower, of St. Neots, in the county of Huntingdon, gas engineer, a creditor of the above-mentioned company, it was ordered that the Gaslight Improvement Company, Limited, be wound up by the Court of Chancery, under the provisions of the Companies Act, 1862; and that the costs of the application, to be taxed by the Taxing Master, be paid out of the estate of the company.

Share List of Metropolitan Gas Companies.

No. of Shares issued.	Amount per Share.	Name of Company.	Amount paid up per Share.	Div. per Cent. per Annum.	Price per Share.
	£		£ s d	£ s d	£ s d
8000	10	Anglo-Romano . .	10 0 0	9 0 0	11 to 12
5000	20	Bahia (Limited) . .	20 0 0	nil.	
1000	20	Do., preference .	20 0 0	10 0 0	27 10 0
750	20	Do., do., redeem.	10 0 0	10 0 0	12 10 0
40000	5	Bombay (Limited).	5 0 0	5 0 0	4 to 4¼
10000	5	Do., third issue .	3 0 0	5 0 0	2 to 2½
10000	20	British, Limited . (Norwich, Hull-Sculcoates, Hanley, Tunstall & Shelton (Potteries), Trowbridge, & Holywell.)	20 0 0	6 0 0	28 to 29
12000	50	*Chartered*	50 0 0	6 10 0	55 to 56
6000	50	Do.	40 0 0	6 10 0	42 to 43
10000	20	*City of London*, A shares	20 0 0	9 0 0	22 to 24
10000	10	Do., B shares	10 0 0	4 0 0	6½ to 7
9629	10	Do., new shares.	10 0 0	9 0 0	11 to 12
25000	25	City of Moscow (L)	25 0 0		12 to 13
17490	25	*Commercial* . . .	25 0 0	10 0 0	31 to 32
2500	20	Continental Union.	20 0 0	4 0 0	13 to 14
17500	20	Do.	17 10 0	4 0 0	10½ to 11¼
10000	20	Do., preference .	20 0 0	7 0 0	
5827	5	County & Gen. (L)	5 0 0	nil.	
2000	5	Do., preference . (Pater, Pembroke, Ely, Lea Bridge, Northfleet, Walton, & Ware.)	5 0 0	nil.	
5000	10	*Crystal Pal. Dist.*	10 0 0	10 0 0	13½ to 14
5000	10	Do., preference .	10 0 0	6 0 0	12½ to 13
10000	10	Do., new shares .	2 10 0	7 0 0	2½ to 3
4000	50	*Equitable*	50 0 0	10 0 0	64 to 65
4000	25	Do., new shares.	25 0 0	10 0 0	32½ to 33
23406	10	European (Lim.) .	10 0 0	10 0 0	12½ to 13¼
12000	10	Do., new shares. (Boulogne, Amiens, Rouen, Caen, Havre, & Nantes.)	5 0 0	10 0 0	7 to 7¼
20000	10	*Gt. Cent. Gaz Cons.*	10 0 0	10 0 0	12¼ to 13
5000	10	Hong Kong (Lim.)	10 0 0	5 0 0	8 to 10
26000	50	*Imperial*	50 0 0	10 0 0	64 to 65
1300	100	Do., bonds . . .	£100	10 0 0	170 to 175
2391	25	Imperial Austrian .	25 0 0	nil.	
28000	50	*Impl. Continental* (Amsterdam, Berlin, Ghent, Hanover, Lille, Rotterdam, Aix-la-Chapelle, Antwp., Bordeaux, Brussels, Cologne, Frankfort-on-M., Haarlem, Stolberg, Toulouse, & Vienna	43 15 0	16 0 0	96 to 97
400	100	Impl. Mexican (L.)	100 0 0	nil.	
200	100	Do., new	100 0 0	nil.	
3000	40	*Independent* . . .	40 0 0	10 0 0	50 to 53
3000	10	Do.	10 0 0	5 0 0	7 to 9
3000	20	Do.	12 10 0	7 10 0	13 to 14
7133	50	*London*	50 0 0	10 0 0	62 to 63
5610	25	Do., 1st pref. .	25 0 0	6 0 0	25 to 26
503	50	Do., 2nd pref. .	50 0 0	6 0 0	
214	50	Do., 3rd pref. .	50 0 0	6 0 0	
18781		Do., 1st pref. sk		6 0 0	
11828		Do., 2nd pref. sk		5 0 0	
12000	5	Malta & Medit. (L.)	5 0 0	4 0 0	3¼ to 4
6000	5	Do., preference .	5 0 0	7 0 0	5 0 0
30000	5	Oriental, Calcutta	5 0 0	9 0 0	5⅝ to 5¾
30000	5	Do., new shares.	1 0 0	9 0 0	1 to 1¼
10000	5	Ottoman (Limited)	5 0 0	nil.	1⅜ to 2½
10000	10	Pará (Limited) . .	10 0 0	6 0 0	9¼ to 9⅝
27000	20	*Phœnix*	20 0 0	10 0 0	25 to 26
3600	100	Do., new	35 0 0	7 10 0	35 to 36
114000	Sk.	Do.	100 0 0	5 0 0	70 to 72
5000	20	*Rateliff*	20 0 0	10 0 0	22 to 24
	20	Rio de Janeiro (L).	20 0 0	10 0 0	22 to 24
6959	5	Singapore (Lim.) .	5 0 0	3 0 0	
2000	5	Do., preference . Shanghai	5 0 0	7 10 0	
4800	50	*Sth. Metropolitan*	50 0 0	10 0 0	71 to 73
15000	10	*Surrey Consumers*	10 0 0	9 0 0	12½ to 13
10000	10	Do., new	6 0 0	9 0 0	7¼ to 7½
9000	4	United General . . (Limerick)	4 0 0		2 to 2¼
16000	10	*Victoria Docks* . .	5 0 0	6 0 0	
3000	10	*Wandsworth & Putney*	10 0 0	7 10 0	13½ to 14
20000	10	Western (L.) Ash.	10 0 0	10 0 0	13⅞ to 14½
10000	10	Do., B shares.	5 0 0	10 0 0	6⅞ to 7
10000	10	Do., C shares.	5 0 0	10 0 0	6½ to 7
20000	10	Do., D shares.	1 0 0	10 0 0	1¼ to 2
8000	5	*West Ham*	5 0 0	7 10 0	6 10 0
6000	5	Do., new shares.	3 0 0	7 10 0	3 18 0
551	10	West London Junction (Lim.) . .	10 0 0	6 0 0	
520	10	Do., preference .	10 0 0	6 0 0	

Price Current.

CASTINGS.—*Per Ton.*

Average Weight of Cast-iron Gas-pipes, per Yard.

1¼ in.	2 in.	2½ in.	3 in	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lb

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow.	Newcastle	Wales.	Yorkshire, Derbyshire, and Staffordshire.
	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
Pig Iron, No. 1 (g.m.b.)	3 15 0	2 14 6	2 7 6	3 10 0	3 10 0
1¼ and 2-inch Socket-pipes	7 10 0	6 0 0	6 15 0	6 15 0	7 10 0
2½ and 3-inch ditto	7 0 0	6 0 0	6 5 0	6 10 0	7 0 0
4 and 5-inch ditto	6 10 0	5 10 0	5 15 0	6 0 0	6 10 0
6 inches and upwards ditto	6 5 0	5 0 0	5 10 0	5 15 0	6 5 0
Retorts, 1st fusion, hot blast	6 0 0	—	5 5 0	5 10 0	6 0 0
Ditto, 2nd ditto, cold ditto	7 0 0	5 15 0	5 15 0	6 0 0	7 0 0
Tank-plates, ¼ thick and above	6 10 0	5 10 0	5 10 0	5 15 0	6 5 0

WROUGHT-IRON TUBING,

Subject to 50 per cent. Discount.

	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent Welded Tubes, from 2 to 12 feet—per foot	1 8	1 0	0 10	0 7	0 5	0 4½
Ditto ditto, from 6 inches to 18 inches—each	3 0	2 0	1 9	1 3	1 0	0 9
Connecting-pieces, or Long Screws	3 6	2 3	2 0	1 6	1 2	0 11
Bends, Springs, and Elbows (wrought iron)	3 9	2 3	1 9	1 0	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 10
Crosses, ditto	4 6	3 0	2 6	2 0	1 6	1 2
Iron Cocks	17 6	9 6	7 6	4 6	3 3	2 6
Ditto, with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing Sockets, Caps, Plugs, and Nipples	1 3	0 9	0 8	0 6	0 5	0 4
Plain Sockets	1 0	0 8	0 7	0 5	0 4	0 3
Syphons, 2-quart	15 0	14 0	13 6	12 0	12 0	—

GAS COALS.—*Per Ton.*

Newcastle.—Unscreened:—

East Castle, Haswells, Nettlesworth Primrose, and South Pelaw	7s. 6d.
Felling, North Pelton, Redheugh Main, Walker's Primrose, West Wear, and Whitwell Primrose	7 9
Burnhope, Craghead, Chariaw, Derwent, Edmondsley, Eighton Moor, Hartlepool Pelaw, Holmside, Lambton's Gas, Lanchester Pelaw, Medomsley, Mickley, New Pelaw, Pelaw Main, Ravensworth, South Moor Pelton, South Leverson, Townley Main, Tyne Main, West Pelaw, Wearmouth Hutton, and Witton	8 0
Peareth, Ravensworth Pelaw, Waldridge, West Garesfield, and West Pelton	8 3
Brancepeth, Dean's Primrose, New Pelton, Pelton, South Peareth, Stella, Urpeth, Washington Hutton, and West Leverson	8 6
Ramsay's Newcastle Cannel	20 0
Wigan Cannel (at Liverpool)	17 0

Scotch Cannel:—

Boghead (at Leith)	45 0
Muirkirk	27 0
Kirkness, best (at Burntisland)	28 6
Capeldrae, 1st quality (at ditto)	28 6
Ditto, 2nd ditto (at ditto)	18 6
Cowdenbeath	12 0
Lesmahago (at Glasgow)	31 6
Ditto (at Granton)	31 6
Arniston	27 6
Wemyss	20 0
Haywood, Wilsontown (at Granton)	23 0
Pirnie, or Methill	15 0
Lothian's Cannel (at Leith)	28 0
Myles' Cannel	23 6

FREIGHTS.

Coastwise—Newcastle.—Per Ton:—

Chatham and Rochester	6 1½
Cork	9s. to 9 6
Dover, Folkestne, & Ramsgate	7 0
Dublin	10s. to 10 6
Exeter Quay	9 0
Ipswich	8 6
London (from Leith)	9 0
London (Pool)	6 6
Lowestoft and Yarmouth	5 0
Portsmouth & Southampton	7 3
Plymouth	8 0
Shoreham	7 6
Whitstable	7 0
Weymouth	8 0

Foreign.—Per Keel:—

Barcelona	£13 0
Bordeaux	13 10
Boulogne and Calais	7 5
Cadiz	11 0
Cronstadt	—
Copenhagen	10 0
Genoa	15 10
Hamburg	11 0
Havre de Grace	8 15
Leghorn	16 0
Lisbon	12 0
Rotterdam	£9 15s. to 10 0
Stettin	10 10
Trieste	11 10
Venice	15 0

SUNDRIES.

Best Nstle. Fire-bks., p. 1000, £2 10s. to £2	15 0
Cliff's Fire-bks. (at Wortley), p. 1000	2 15 0
Ingham's ditto (at Wortley), p. 1000	2 15 6
Fire-clay Retorts, p. ft. run, 5s. 6d. to	0 7 0
Tough Cake Copper, p. ton	76 0 0
English Pig Lead, p. ton	19 5 0
Welsh Bar Iron (in London), p. ton	6 10 0
Foreign Spelter, p. ton	21 15 0
English Block Tin, p. ton	96 0 0
Banca, p. ton	97 10 0
Tarred Rope Yarn, p. cwt.	1 0 0

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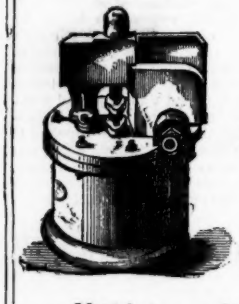

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EDGE'S PATENT INDEX.

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(A CYLINDER & PISTON.)

The ABC GAS-METER shows in plain figures the money payable for Gas consumed, as well as the number of cubic feet.

MYERS'S WATER-METER is accurate in measurement, simple in action, and moderate in price.

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WANTED, immediately, a Manager. He must have had experience in the working of similar undertakings, be capable of keeping accounts, collecting the rates, and generally conducting the business of the Company under the supervision of the Board of Directors. He will be required to reside in Aylesbury, at the head office of the Company. Security required.

Application to be made to the Secretary, with testimonials, and stating amount of salary required.

HENRY WYATT, Secretary.

Aylesbury, Nov. 20, 1867.

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THE Advertiser is open to an Engagement as ASSISTANT ENGINEER in a large Gas-Work, or Manager in one where the make is 10,000,000 and upwards per annum. Is a practical gas engineer, and has had very good experience in every department of Gas-Works. References and testimonials of the highest kind.

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GAS Manager wanted, to take charge and manage a Gas-Work in Italy. Must be experienced, and have good references. One who understands the language preferred.

Apply in writing, stating salary, to "ITALIAN," care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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A Very Large Quantity of Gas can be obtained by the decomposition of Coal Tar by Phillips's Patent Process, and the residual product is of value, being useful for sanitary purposes as a deodorizing matter.

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COTTON SEED PITCH.

ABOUT 400 tons of this valuable substitute for Cannel Coal to be SOLD.

Mr. Evans, of the Chartered Gas-Works, reports that this Pitch yields 22,000 cubic feet of 28-candle gas per ton.

The Gas being very rapidly produced makes this material a great desideratum for Gas Managers.

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FOR SALE.—A Good Cast-Iron Tank, in excellent condition, 45 feet diameter, 14 feet deep, either with or without Gasholder.

Also the following STATION-METERS:—

One to pass 12,000 cubic feet per hour.				
One	,,	8,000	,,	,,
One	,,	4,000	,,	,,
Two	,,	3,000	,,	,,

The whole have been taken apart, thoroughly examined, and are in good working order, equal to new.

The above have been taken down to make room for larger.

Apply to JOHN VICKARY, Gas Engineering Works, EXETER.

FOR SALE cheap, a 6-foot Testing GASHOLDER, in thorough working order, and nearly new.

Can be seen at 80, KING'S CROSS ROAD.

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THESE Retorts have been introduced at a large number of Gas-Works. The great durability of the Ribbed Iron Retort specially recommends it for works where an exhauster is not used. The Clay Ovens and Retorts are so constructed as to favour the more speedy and effectual carbonization of the Coal, whilst the deposition of Carbon does not so readily take place as in the ordinary Retorts.

Illustrated circulars with prices delivered will be furnished on application to ALEX. C. FRASER, Gas-Works, COLCHESTER.

GREEN COPPERAS
(SULPHATE OF IRON)
For Gas Purifying, £2 per Ton.
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Retort Mouthpieces, Bolts, Nuts, and every description of Wrought-Iron Work.

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Sir,—I have much pleasure in testifying that the 100-foot Telescope Gasholder and Cast-Iron Tank, erected by you for this Company in 1862, has given the highest satisfaction, and never required the slightest attention or adjustment since its completion.

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He has also erected a 100-foot Gasholder and Cast-Iron Tank at **Exeter;** an 80-foot Telescope Gasholder and Iron Tank at **Devonport;** a 90-foot at **Torquay,** &c. &c. At either of those works satisfactory references can be made.

He also begs particular attention to his **Improved Gas-Meters,** either **Wet, Dry, or Compensating,** the materials and workmanship of which guaranteed of the very best description, and which has gained for his Meters so excellent a reputation for these last **20 years.**

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Gas-Fittings of the most modern designs.
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JAMES RUSSEL & SON

Beg to draw attention to the following Abstract of Professor A. FYFE's Analysis of their Boghead Coal, and to intimate that they are prepared to enter into Contracts for the same. The Shipping Ports are Leith, Bo'ness, Grangemouth, and Glasgow; and there is communication by Rail to all parts of the Kingdom.

ABSTRACT OF REPORT BY PROFESSOR FYFE

ON THE VALUE OF

BOGHEAD CANNEL COAL

FOR THE PRODUCTION OF GAS.

One hundred parts of the Coal, by analysis, afforded, on an average :—

Volatile matter.....	69				
Coke.....	31	consisting of	Carbon. 9·25	= 30	per cent.
			Ashes.. 21·75	= 70	,,
	100		31·0	100	,,

The Specific Gravity is 1180 compared to that of Water at 1000. The per centage of Sulphur amounted to 0·13, equivalent to nearly three pounds in the ton of Coal. The following table shows the average result of ten trials :—

Cubic Feet of Gas per Ton of Coal.	Specific Gravity.	Condensation by Chlorine in 100 parts.	Durability : 1 Foot burns	Illuminating Power : 1 Foot = Light of Candles. 140 Grs.	120 Grs.	1 Foot = Grains of Sperm.	Gas of 1 Ton = lbs. of Sperm.	Lbs. of Coke per Ton of Coal.
			MIN. SEC.					
15,486	726	23·37	84 44	8·9	10·38	1245·6	2755·6	760

Table showing comparative value of the following Coals for making Gas :—

Coals.	Cubic Feet of Gas per Ton.	Illuminating Power, 1 Foot = Light of Candles. 120 Grs.	Comparative Value of Gases according to Illuminating Power.		Comparative Value of Coals according to Illuminating Power and Quantity of Gas afforded.	
Best English Caking	9,746	3·18	1·00	..	1·00	..
Average Lesmahago.....	10,176	8·77	2·75	1·00	2·87	1·00
Average Boghead.	**15,486**	**10·39**	**3·25**	**1·18**	**5·17**	**1·77**

Table showing comparative value, by the Chlorine test, of the Boghead and other Coals for making Gas :—

Coals.	Cubic Feet of Gas per Ton.	Condensation by Chlorine in 100 parts.	Durability : with Jet Flame 5 Inches 1 Foot burns	Value of Gas according to Condensation by Chlor. and to durability.	Value of Coals according to Value & Quantity of Gas.	Com. Value of Scotch Coals, only taking Value & Quantity of Gas into account.
			MIN. SEC.			
English Caking	9,746	6·5	50 40	1·00	1·00	..
English Parrot.....	10,500	7·6	44 30	1·02	1·08	
Marquis of Lothian's ..	10,000	13·0	60 0	2·35	2·41	1·00
Lesmahago.....	10,176	17·5	70 0	3·72	3·87	1·64
Wemyss.....	10,000	19·5	75 0	4·44	4·55	1·94
Kirkness.....	9,620	20·75	80 18	5·06	4·99	2·06
Boghead.....	**15,486**	**23·37**	**84 22**	**6·09**	**9·67**	**4·01**

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NOTE.—*Certificates of origin issued by them for all Cargoes of Boghead Coal.*

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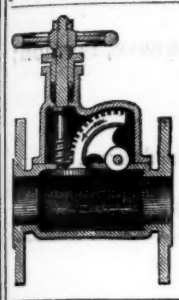

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It will be seen, by reference to the drawing, that by this simple method a clear water-way is obtained, the disc being drawn by the screw or worm entirely out of the way; thus all the advantages of the ordinary sluice-valve are obtained at much less cost, and the liability to set fast and get out of order entirely obviated. They are adapted for all purposes for hot or cold water, and equally suited for high or low pressure; and in case of need of repair, a new valve-seat can be applied without removing the body or case of the valve.

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"The results have been very remarkable, for they show an average increase of 63 per cent. on the illuminating power of the gas. I am of opinion, therefore, that the invention is of great practical value."

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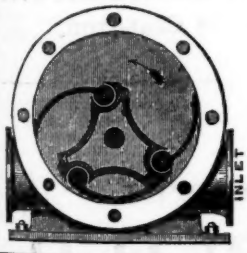

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AND

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PATENT APPARATUS

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CHARGING & DRAWING GAS-RETORTS,

AND FOR

CLOSING THE MOUTHS OF RETORTS

WITHOUT CEMENT.

The above is one of the most important inventions in connexion with gas manufacture which has been introduced for many years, and merits the immediate attention of all Gas Companies. The Machine is simple in its construction, easily worked, and not likely to get out of order, while the saving in time and labour is very considerable. It has been applied at the Chartered Gas-Works, Westminster, with complete success, and has been viewed in operation by some of the most eminent gas engineers, both in London and from the provinces, their unanimous opinion being that the arrangement of the apparatus was perfectly new, and must eventually be adopted by all Gas Companies.

The Patentees are now in a position to treat for the use of their Apparatus.

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D. W. OGG and CO. have lately engaged to represent one of the largest shippers of Scotch Cannels at prices that cannot fail to command the attention of Gas Companies at a period like the present, when quality of gas seems so desirable.

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MR. HENRY GORE, Civil Engineer, begs to inform his friends that, having completed his engagements in Mexico and South America, he now offers his services as CONSULTING ENGINEER in matters relating to Gas or Water Works and Town Improvements. From his long and extensive practice in connexion with Gas-Works, he is fully prepared to advise municipal or other public bodies on all questions of supply of gas for street lighting.

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CAST-IRON Retorts, Socket Pipes, with Syphons and all requisite Connexions, Lamp Columns, Wrought Iron Tubing, Valves, Street Lamps, Sight Holes, Furnace Doors, Ash Pans, Charging and Coke Shovels, Iron Pails and Coke Barrows, Cross Bars, Fire Pots, Pumps, Iron Borings.

PURIFIERS, CONDENSERS, and SCRUBBERS erected complete, or the materials supplied; with every description of goods in use by Gas-Works, in stock, on wholesale prices, at

Mr. LYNCH WHITE'S,

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AUCHINHEATH, Lesmahago, Gas COAL, known in the market for the last fifty years as a first-class gas coal.

JAMES FERGUSON and CO.,

Sole Lessees of the Auchinheath Coal-Field, are prepared to ship the above at Glasgow, Greenock, and Ardrossan, on the west coast of Scotland; and at Granton or Leith, in the Firth of Forth, on the east coast. Also to forward them to any railway-station in Scotland or England.

Price and other particulars may be learned by addressing

JAMES FERGUSON and CO.,

GAS COAL WORKS,

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GAS EXPLOSIONS PREVENTED

BY THE USE OF

JOHN RUSSELL & CO.'S TUBES & FITTINGS.

Gas Explosions are of frequent occurrence, but we do not hear of them unless death has resulted. As in the case at Clerkenwell lately, gas explosions may generally be traced to the use of Tubes of defective workmanship and inferior iron. Adopt the Tubes and Fittings of John Russell and Co., which are all of the best quality.

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ARE THE

INVENTORS OF THE LAP-WELDED TUBE FOR LOCOMOTIVE & MARINE BOILERS,

AND THE OLDEST MANUFACTURERS OF TUBES FOR GAS, STEAM, & WATER.

WAREHOUSES:

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ECONOMY IN GAS PURIFICATION.

Mc DOUGALL'S

HYDRATED PEROXIDE OF IRON.

This Oxide is now well known, and has gained at a number of the largest gas-works at home and abroad a decided preference for efficiency and durability. It is free from any mixture of sawdust or other material, every particle being available for use, thus causing the Purifiers to work double the time before it requires renewing, and saves one-third the cost of labour in charging them. It readily takes up sulphur, revivifies rapidly, and lasts longer than any other Oxide in the market. Prices on application to—

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THE ONLY COMPLETE CAST-IRON CASED DRY GAS-METER,

PATENTED MARCH 31, 1865.

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Drawings explanatory of the above on application.

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Station-Meters and Gas Apparatus, Consumers Wet Gas-Meters in Cast-Iron, and Dry in Tin Plate Cases.

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DRY GAS-METER.

210,000 IN USE.

WORKS:

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KIRKWOOD CANNEL COAL.

This Coal is largely used in the Gas-Works at Glasgow, Paisley, Port Glasgow, Edinburgh, Leith, and many other towns throughout Scotland. It yields 10,648 cubic feet per ton; illuminating power, 27·55 standard candles; coke per ton, 9 cwt. 83 lbs. Railway communication from the pits (at Coatbridge) to all parts of the country; ports of shipment in Firths of Forth or Clyde.

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(owner of the Works at which Fire-clay Retorts were first made), having greatly enlarged his works, can supply retorts and other fire-clay goods to any extent.

References can be given to managers of above a hundred Gas-Works whom he supplies.

WILLIAM FRASER ships COWDENBEATH PARROT COALS at Charlestown and Burntisland at 11s. per ton; and HALBEATH STEAM COALS, on Navy List, at 8s. 6d. per ton.

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AND

WENLOCK IRON WHARF, 20, WHARF ROAD, CITY ROAD, LONDON,

Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water-Works, including Iron Retorts, Socket and Flange Pipes, Bends, Branches, and Syphons of all sizes, Lamp Columns, &c., &c.

N.B.—Orders for Cast-iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention.

CHARLES HORSLEY, Agent.

OXIDE OF IRON,

We are prepared to supply, on moderate terms,

HYDRATED PEROXIDE OF IRON (BOG OCHRE),

Same quality as supplied by us to several of the most extensive Gas Companies, and which has given entire satisfaction.

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BELFAST.

INTERNATIONAL EXHIBITION,

1862. CLASS X.

PRIZE MEDAL

For excellence of Fire-Clay Gas Retorts, and "HONOURABLE MENTION" for good quality of Fire-Bricks.

WILLIAM STEPHENSON & SONS,

THROCKLEY,

NEWCASTLE-ON-TYNE.

THOMAS CARR & SON,

MANUFACTURERS OF

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SCOTSWOOD FIRE-BRICK WORKS,

NEAR

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PROPRIETORS OF

BEST GLASS-HOUSE POT AND CRUCIBLE CLAY

MANUFACTURERS OF

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AMBLECOTE FIRE CLAY AND BRICK WORKS,

STOURBRIDGE.

Late in the occupation of I. and W. King. Originally J. Pidcock, Esq.

NB A quantity of best Clay Retorts in stock, viz.—Circulars, 14 inches, 15 inches. 16 inches. D's, 16×12, 15×14, 20×16, 16×18.

HANCOCK'S INDIA-RUBBER GAS-TUBING.

All sizes, from ¼ in. to 4 in. diameter and upwards.

Also,

HORSE SINGEING APPARATUS, best make, with GAS-BURNERS, COMBS, and INDIA-RUBBER TUBING, all complete.

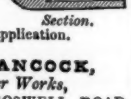
INDIA-RUBBER BAGS for GAS-MAINS.

WASHERS for GAS and STEAM JOINTS.

VALVES (pure solid Rubber) for STEAM-ENGINES.

PACKING (Elastic) for STEAM-ENGINES.

FLANGE TUBING, for excluding Draughts and Dust through WINDOWS, DOORS, and GLASS CASES.



Section.

Illustrated Price Lists on application.

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Vulcanized India-Rubber Works,

GOSWELL MEWS, AND 266, GOSWELL ROAD LONDON, E.C.

Trade Mark. THE MEDAL FOR 1862.

THE ONLY PRIZE MEDAL AWARDED FOR TUBES AND FITTINGS.

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MR. G. W. STEVENSON, C.E., F.G.S.,

(for the last 10 years Engineer to the Corporation of Halifax), may be consulted upon all matters connected with the construction of gas-works, and the manufacture and supply of gas; also upon the construction of water-works and the supply of water to towns; and also in respect to the sewerage of towns, and sanitary works generally.

OFFICE: 14, Park Street, WESTMINSTER.

ALFRED PENNY, Gas and

CONSULTING ENGINEER,

WENLOCK IRON WORKS,

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Mr. PENNY having had a large experience in the construction, alteration, and management of Gas-Works, begs to inform the Directors of Gas Companies that he may be consulted on all matters appertaining thereto. He also manufactures Gasholders, Purifiers, and all the various apparatus used in Gas-Works, and keeps in stock Retorts and Mouthpieces, Socket-Pipes, Bends, Branches, T-pieces, &c. &c.

Plans, Specifications, and Estimates prepared.

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SOCKET, FLANGE, HOT-WATER PIPES, AND ALL CONNEXIONS; RETORTS, HYDRAULIC MAIN, LAMP-COLUMNS, &c.; AND EVERY DESCRIPTION OF CASTINGS AND WROUGHT-IRON-WORK FOR GAS AND WATER-WORKS, STEAM, AND GENERAL PURPOSES.

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Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

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J. SUGG and CO., late ALBERT KELLER, Ghent.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications, addressed to J. SUGG and Co., GHENT, will receive immediate attention.

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ADDISON POTTER,

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NEAR NEWCASTLE-UPON-TYNE,

Manufacturer of Clay Retorts, Fire-Bricks, and every description of Fire-Clay Goods.

BEST AND HOBSON,

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Brass and Iron Gas-Fittings, Steam and Water-Cock &c., &c.

Also,

PATENT WELDED IRON TUBES,

For Gas, Steam, Water, and other purposes.

GAS APPARATUS OF EVERY DESCRIPTION.

High-pressure Water-Valves and Cocks, &c., &c.

Plumbers Brassfoundry,

BRASS, COPPER, COMPOSITION, AND LEAD TUBES.

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STATION-METERS ANY SIZE.

PHOTOMETERS, EXPERIMENTAL METERS

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FIRE-BRICKS, LUMPS, SQUARES, and TILES of all dimensions.

GAS-RETORTS always in stock.

GARDEN EDGINGS of various patterns.

ORNAMENTAL BUILDING BRICKS.

GRATE BACKS in various designs.

Contracts entered into to set Retorts, erect Furnaces, &c.

Shipments on the shortest notice.

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SOUTHWARK, LONDON, S.E.,

DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for

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B. CARPENTER'S Improved Wood SIEVES for Gas-Purifiers.

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The above sieves are used by the principal gas companies in London and the country. Their utility, durability, and cheapness combined, render them superior to all others.

Testimonials from gas engineers who have tested their qualities forwarded on application.

All orders punctually attended to, and estimates given if required.

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GAS ENGINEERS,

MANUFACTURERS AND CONTRACTORS FOR GAS-WORKS

Of any extent at Home and Abroad,

GOWTS BRIDGE WORKS, LINCOLN,

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JOHN STREET, ADELPHI, LONDON, W.C.

ROBERT MACLAREN and CO., EGLINTON FOUNDRY, GLASGOW,

Manufacturers of all sizes of Cast-Iron Main Pipes, by an improved Patent. General Ironfounders, Gas Engineers, and Wrought-Iron Tube Makers.

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MANUFACTURERS OF

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GAS APPARATUS,

PIPES, VALVES, IRON ROOFS,

WROUGHT AND CAST-IRON GIRDER

DESIGNS, SPECIFICATIONS, & ESTIMATES FURNISHED.

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MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

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CLARIDGE, NORTH, & CO.,

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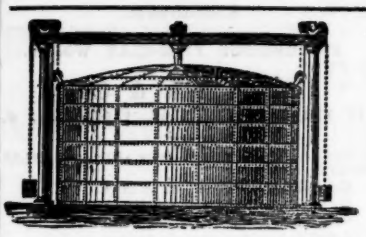

IMPROVED GAS APPARATUS,

FOR TOWNS, VILLAGES, &c.,

INVENTED AND MANUFACTURED BY

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WHITESTONE IRON-WORKS, HUDDERSFIELD.

WILL BE SENT ON APPLICATION:—

PLANS, SPECIFICATIONS, and PRICES of GAS APPARATUS;

PLANS, SPECIFICATIONS, and ESTIMATES of the requisite BUILDINGS for each size of Apparatus;

PLANS of the IMPROVED ANNULAR CONDENSERS;

PLANS of the COMBINED PURIFYING APPARATUS, so eminently adapted for Exportation.

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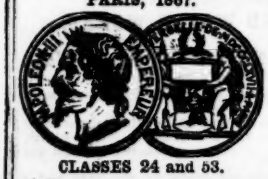

CLASSES 24 and 53.

WILLIAM SUGG,

GAS ENGINEER.

LONDON, 1862.

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LAMP METERS AND BOXES.

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WILLIAM INGHAM AND SONS,

WORTLEY FIRE-BRICK AND RETORT WORKS,

Near

Leeds.

W. INGHAM and SONS, having for many years been extensively engaged in the Manufacture of

RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY

beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.

The Works are of such magnitude as to ensure the prompt execution of orders to any extent.

Estimates for Setting, or Bricklayers sent when required.

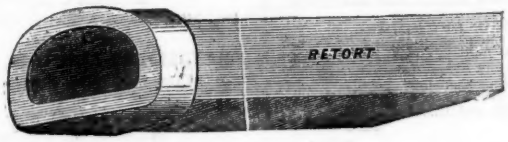
GAS OVENS IN SEGMENTS OF EQUAL QUALITY.

A large stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all sizes kept in London at CHRISTIE & CO.'s Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.

N.B.—*Export orders continue to have prompt attention.*

KING BROTHERS,

STOURBRIDGE FIRE-BRICK AND RETORT WORKS.



KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them FREE FROM CRACKS AND CORRECT IN FORM. By great care in Manufacturing, combined with the advantages in burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonize.

Retort Ovens, Fire-Bricks, Guards, Saddles, Rabbitted Burs, Flues, and Quarries, are all Manufactured of the same quality of Clay.

Every Retort and Brick is branded "King Brothers, Stourbridge."

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J. DEFRIES & SONS,

GAS ENGINEERS,

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CRYSTAL, BRONZED, & ORMOLU

CHANDELIERS;

IMPROVED CRYSTAL STAR AND SUN LIGHTS;

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EVERY DESCRIPTION OF GAS-FITTINGS.

WORKS:

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Beg most respectfully to inform Gas Companies and the Trade that their

NEW CITY SHOW-ROOMS

Are now complete with every description of Lighting Mediums, including Registered Designs of Mediæval Gas-Fittings, Crystal, Bronzed, Ormolu, and Electro-Plated Chandeliers, Brackets, Vestibule-Lights, Bronzed and Gilt Statuettes.

Special Designs prepared in perfect accordance with architectural arrangements. Estimates furnished for the Lighting and Fitting up of Theatres, Music-Halls, and Public or Private Buildings with Gas.

GAS MOONS of the Newest Designs.

THE PATENT GAS-REGULATOR & PURIFIER

Reduced to 6s. 6d. per Dozen.

Pattern Books of Gas-Fittings, Crystal and Ormolu Chandeliers for 1866-67, are now complete.

WORKS:

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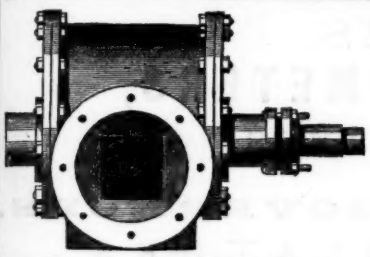

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MAKERS OF ENGINES, MACHINERY, and IRONWORK for GAS-WORKS,
efficient and durable TAR, LIQUOR, and SYPHON PUMPS,
GAS-VALVES, with or without Wedges, worked with powerful Worm and Rack,
SELF-ACTING BY-PASS VALVES, with Lid and Relieving Lever,
ROTATORY, TUMBLER, and CAPILLARY WATER DISTRIBUTORS for SCRUBBERS.
SMALL-SIZE EXHAUSTERS KEPT IN STOCK.

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GAS AND CONSULTING ENGINEER.

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PATENTEE & MANUFACTURER of the following Inventions:—

RETORT SETTINGS, heated by tar without the production of smoke.
STEAM-ENGINES and EXHAUSTERS, separately or combined.
FOUR-WAY VALVES, one of which is equal to three ordinary Valves.
STATION GOVERNORS in which the Gasholder cannot tilt and cause accidents.

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GEORGE RAIT, MANAGING DIRECTOR. T. G. BARLOW, C.E., CONSULTING ENGINEER.

CROLL'S DRY GAS-METER,
(Invented and Patented in 1844, since which time 200,000 of these Meters have been manufactured by Mr. CROLL,)
Obtained PRIZE MEDALS at the EXHIBITIONS of London, 1851, of New York, 1853, and Paris, 1855.
IMPROVED in 1858,
And was awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for
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Now manufactured by the GAS-METER COMPANY, LIMITED, KINGSLAND ROAD, LONDON; and, for the purpose of obtaining greater accuracy in all its parts, the most perfect machinery has been adopted, "By which the construction of the Meter is much simplified, while its liability to get out of order is diminished." (See report of T. G. BARLOW, Esq., C.E.)

ALEXANDER WRIGHT & CO.,
MANUFACTURERS OF
WET METERS,
COMPENSATING WET METERS,
AND
IMPROVED DRY METERS
of the very highest excellence.
STATION-METERS AND GOVERNORS.
STREET-LAMP REGULATORS.
TESTING APPARATUS
of the most perfect description for all purposes relating to Gas.
KEELING'S PATENT STATION-GOVERNOR REGULATOR.
55 and 55a, MILLBANK STREET, WESTMINSTER, S.W., and COPENHAGEN.

BOGHEAD GAS COAL.
JAMES RUSSEL & SON, FALKIRK, N.B.
See Advertisement, page 982.
THE BRITISH IRON TUBE COMPANY,
MANUFACTURERS OF
PATENT WELDED WROUGHT-IRON TUBES & FITTINGS, FOR GAS, STEAM, & WATER;
SCREWING TACKLE, CORE BARS,
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D. HULETT and CO., 55 and 56, HIGH HOLBORN, LONDON,
PATENTEES and MANUFACTURERS of the ONLY GOOD MERCURIAL GAS REGULATOR,
invite the attention of Gas Companies and the Trade generally to their Improved GAS-METERS, which they warrant equal to any in Quality, Workmanship, and Simplicity of Construction, and the only Meters from which Gas cannot be obtained without being duly registered.
MANUFACTURERS OF
GAS CHANDELIERS, GLASS LUSTRES, HALL LANTERNS, VESTIBULES, BRACKETS, PENDANTS;
DOUBLE CONE, ALBERT, SHADOWLESS, & EVERY DESCRIPTION OF BURNER, UNION JETS, BATSWINGS, ETC.;
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CAST & WROUGHT-IRON PIPE BLACK & GALVANIZED. COPPER, TIN, BRASS, & COMPOSITION TUBING.
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London: Printed by WILLIAM BOUGHTON KING (at the office of Clayton and Co., 17, Bouverie Street, Fleet Street); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, November 26, 1867.